



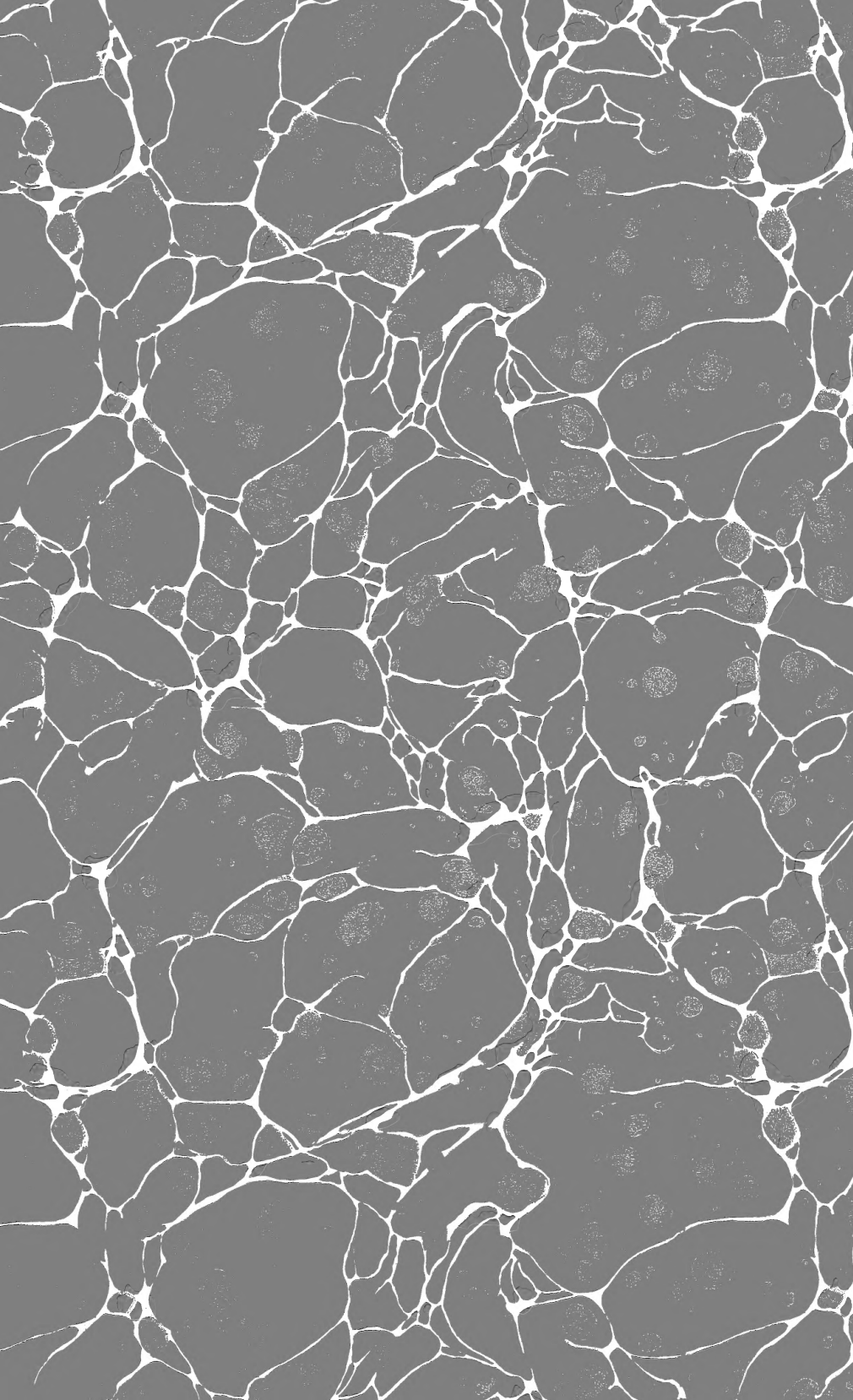
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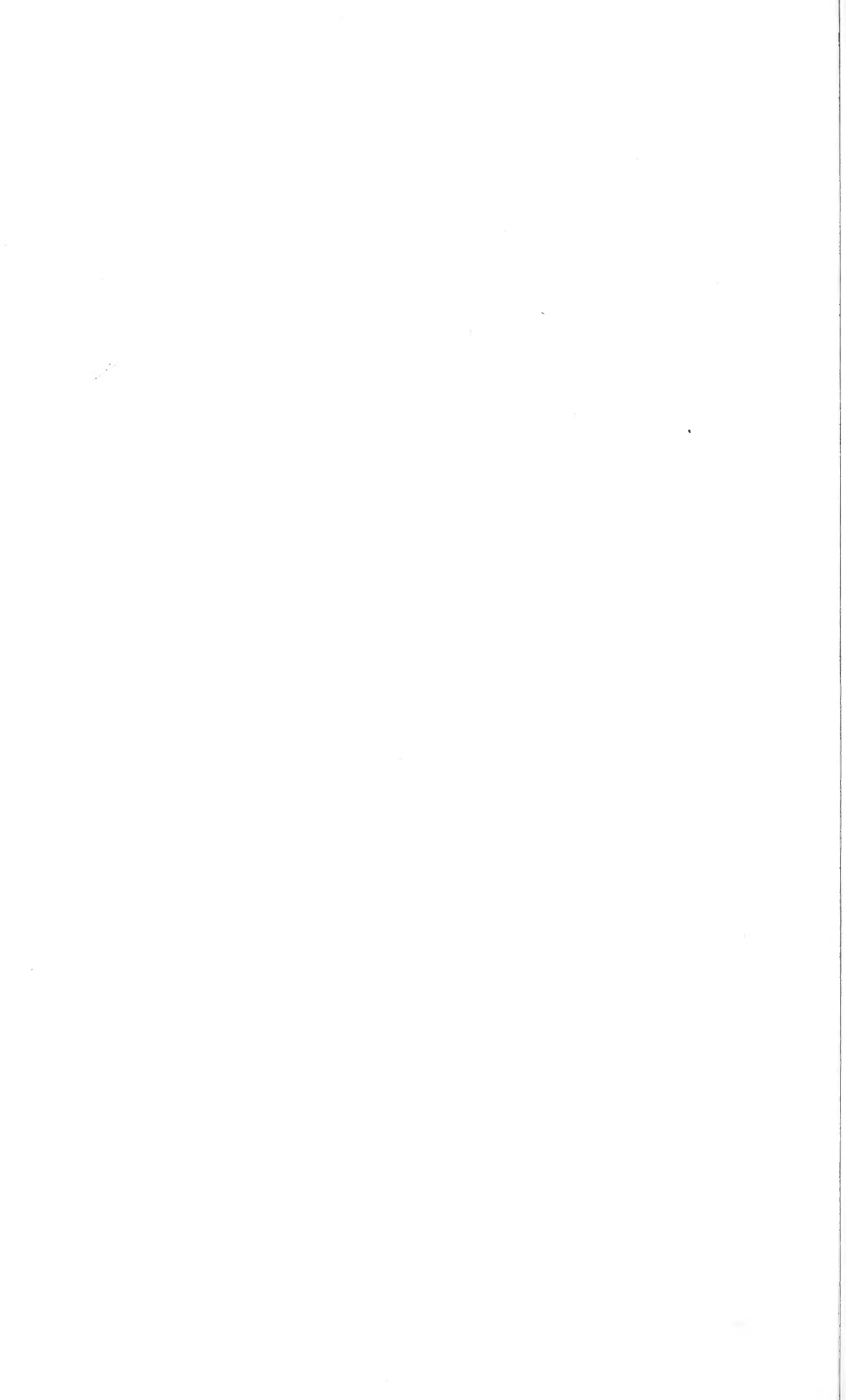
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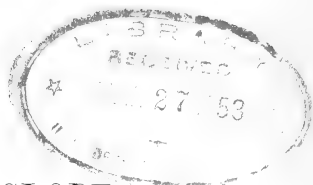


U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF BOTANY.

ILLUSTRATIONS OF NORTH AMERICAN GRASSES.

VOL. II.



GRASSES OF THE PACIFIC SLOPE,

INCLUDING ALASKA AND THE ADJACENT ISLANDS.

PLATES AND DESCRIPTIONS

OF THE

GRASSES OF CALIFORNIA, OREGON, WASHINGTON, AND THE NORTHWESTERN
COAST, INCLUDING ALASKA.

By DR. GEO. VASEY,

BOTANIST, U. S. DEPARTMENT OF AGRICULTURE.

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NOTE.

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LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF BOTANY,
Washington, D. C., February 11, 1893.

SIR : I have the honor of presenting for publication the second part of "Grasses of the Pacific Slope, Including Alaska and the Adjacent Islands," which completes the second volume of "Illustrations of North American Grasses." I respectfully recommend that when the printing of this work shall have been completed a suitable number of copies shall be bound with the first part of the same volume, which was issued in October, 1892, as Bulletin No. 13, part 1, of this Division.

GEO. VASEY,
Botanist.

Hon. J. M. RUSK,
Secretary of Agriculture.

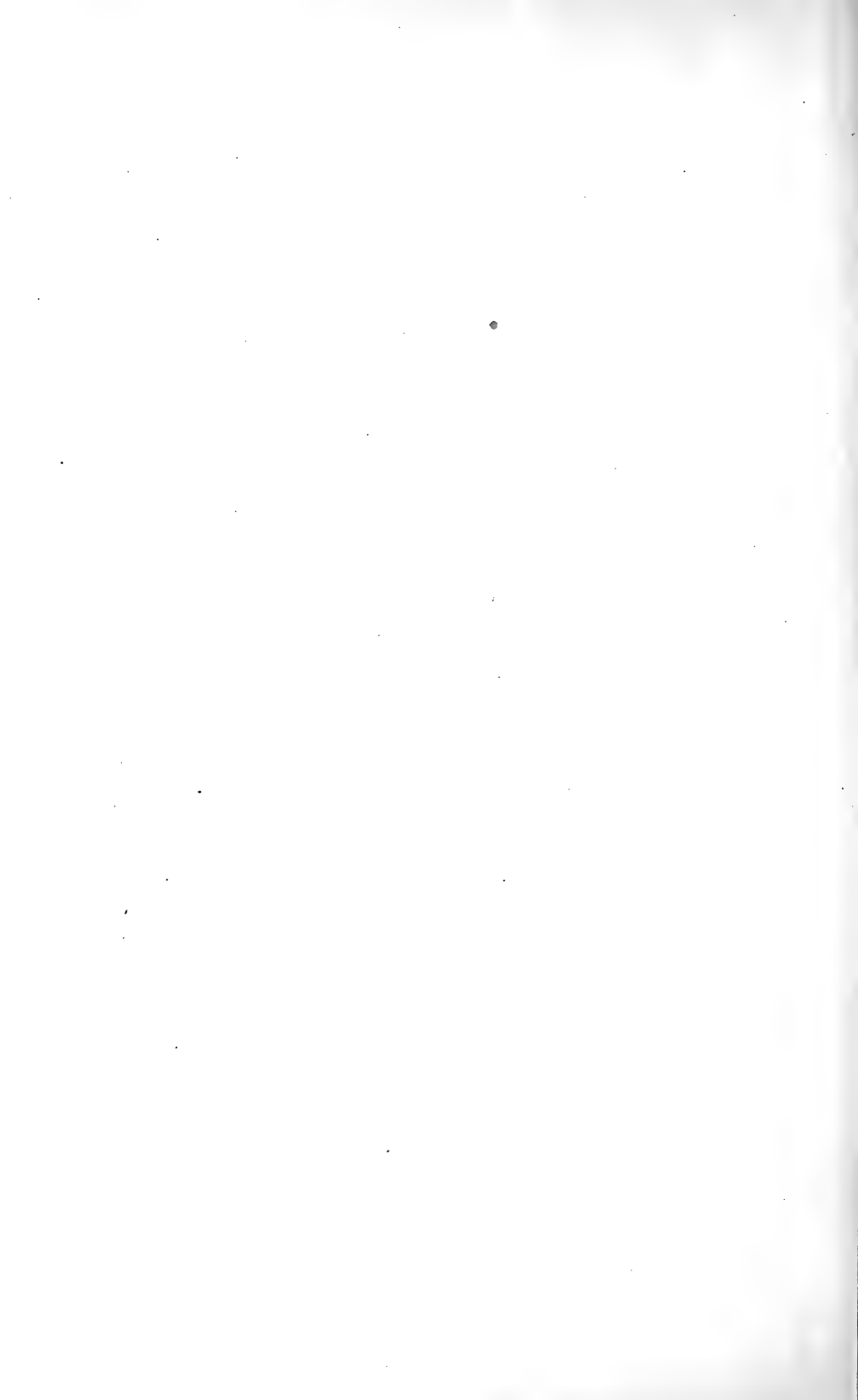
INTRODUCTION.

The grasses which are known to grow on the Pacific slope of the United States, including Alaska, number not far from 200 species. These are nearly all specifically distinct from the grasses growing east of the Mississippi River, and also mainly distinct from the grasses of the plains and of the desert, except in that part of California which partakes of the desert flora.

A considerable number of the grasses of the mountain regions of California, Oregon, and Washington reappear in the mountains of Idaho, Montana, and the interior Rockies. The interior of California is a dry region, verging in the extreme south into the desert country, and is deficient in grasses, especially of those species which form a continuous turf. In this volume we have figured and described mainly those grasses which are most conspicuous in size and apparent utility. Nearly all are here illustrated for the first time.

The descriptions of the species are almost wholly the work of Mr. L. H. Dewey, Assistant Botanist.

GEO. VASEY.



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GRASSES OF THE PACIFIC SLOPE,

INCLUDING ALASKA AND THE ADJACENT ISLANDS.

PART I.

No. 1.

IMPERATA HOOKERI Rupr. in Anderson Proc. Stockholm Acad. 1855, 160.

Plant perennial, rather coarse; few culms in a stool, on short-jointed rootstocks $\frac{1}{8}$ inch in diameter.

Culms erect, simple, smooth, terete, 2 to 3 feet high.

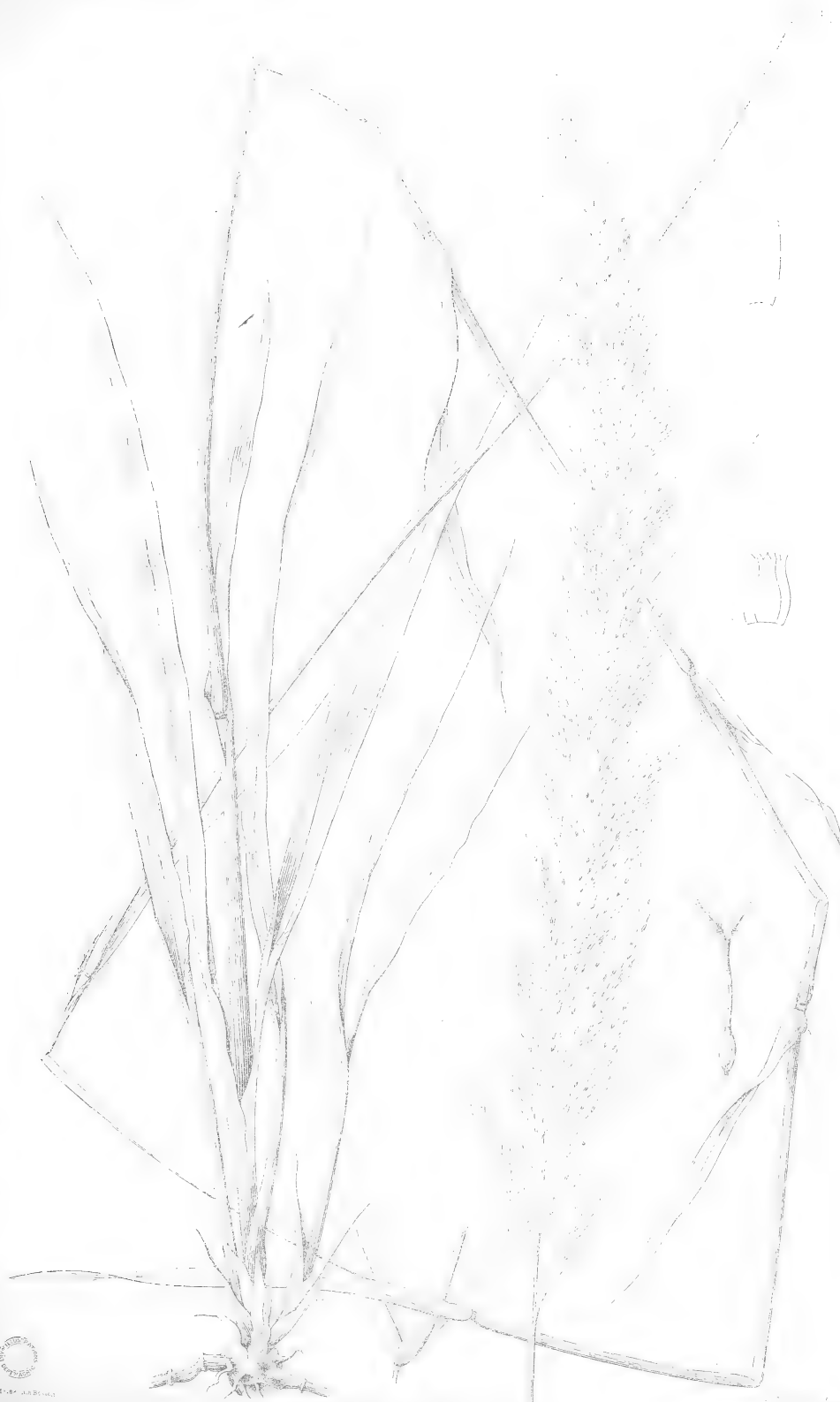
Leaves from the base numerous with rather scarious, smooth sheaths and flap blades 6 to 12 inches long. Leaves of culm 4; sheaths smooth, close, longer than the internodes; blades flat, slightly scabrid on the margins and lower surface, slender-pointed, 3 to 5 inches long, or the upper short and appressed; ligule membranaceous, truncate, 1 line long, ciliate with longer hairs at the sides.

Inflorescence an erect, white-hairy, spike-like panicle 6 to 16 inches long and 1 inch in diameter; branches mostly in threes or fours, ascending or appressed, many-flowered throughout.

Spikelets 1-flowered, nearly sessile, narrowly lanceolate, $1\frac{1}{2}$ lines long; empty glumes covered with fine white hairs 4 to 6 lines long; first glume lance-ovate, obtuse, membranaceous on margins and above, indistinctly 5 to 7-nerved, $1\frac{1}{2}$ lines long; second glume like the first but $\frac{1}{4}$ line shorter; floral glume ovate, acute, membranaceous, smooth, 1-nerved, $1\frac{1}{4}$ lines long; palet oblong, irregularly dentate, $\frac{2}{3}$ line long; grain obovate, translucent amber-color, $\frac{1}{3}$ line long, falling with spikelet entire; style slender with two prominent, brown, feathered stigmas, long-exserted, making the woolly panicle appear specked with brown.

PLATE I; *a*, empty glumes enlarged about 12 times; *b*, floral glume; *c*, palet; *d*, grain with style and stigmas.

Southern California, Arizona and western Texas. Probably a useful agricultural grass for hot, arid districts.



IMPERATA KOENIGII

No. 2.

PANICUM URVILLEANUM Kth. Rev. Gram. i. 35, 402; ii. t. 115.

Plant perennial from strong rootstock.

Culm erect, simple, nearly smooth, terete, $1\frac{1}{2}$ to 2 feet high, the short-jointed base covered with weather-worn sheaths.

Leaves of culm 4 to 7; sheaths loose and overlapping, retrorse-velvety; blades at length convolute, slender-pointed, striate, glabrous, or pubescent beneath near the base, upper one exceeding the panicle, 12 to 18 inches long; ligule a line of soft hairs $\frac{1}{2}$ line long.

Inflorescence an open panicle 6 to 10 inches long and half as wide; ascending branches subverticillate or scattered, racemose and flower-bearing near the ends, or shorter ones flower-bearing throughout.

Spikelets pedicellate, 2-flowered, ovate, acute, $2\frac{1}{2}$ to 3 lines long; empty glumes broadly ovate, acute, convex, silky-villous; first glume 7-nerved, 2 to $2\frac{1}{4}$ lines long; second glume 13-to 15-nerved and one third longer; floral glume of staminate flower pubescent, 11-to 13-nerved, $2\frac{1}{4}$ lines long; palet lanceolate, thin, $2\frac{1}{4}$ lines long; floral glume of pistillate flower hardened, smooth except the ciliate margins, 5-nerved, 2 lines long; palet smooth, 2-nerved, 2 lines long.

PLATE II; *a*, spikelet slightly spread and enlarged about 4 times; *b*, first empty glume; *c*, second empty glume; *d*, floral glume of perfect floret; *e*, palet of perfect floret; *f*, floral glume of sterile floret; *g*, palet of sterile floret.

Southern California and Arizona. Plainly distinguished by its large wooly spikelets.



H. Moore, Un. Berlin

PANICUM URVILLEANUM AG

T. H. Moore

CENCHRUS PALMERI Vasey, Proc. Cal. Acad. Ser. 2. ii. 211.

Plant annual, rather low, spreading, usually rough-pubescent throughout.

Culms geniculate below, branching, 5 to 15 inches high.

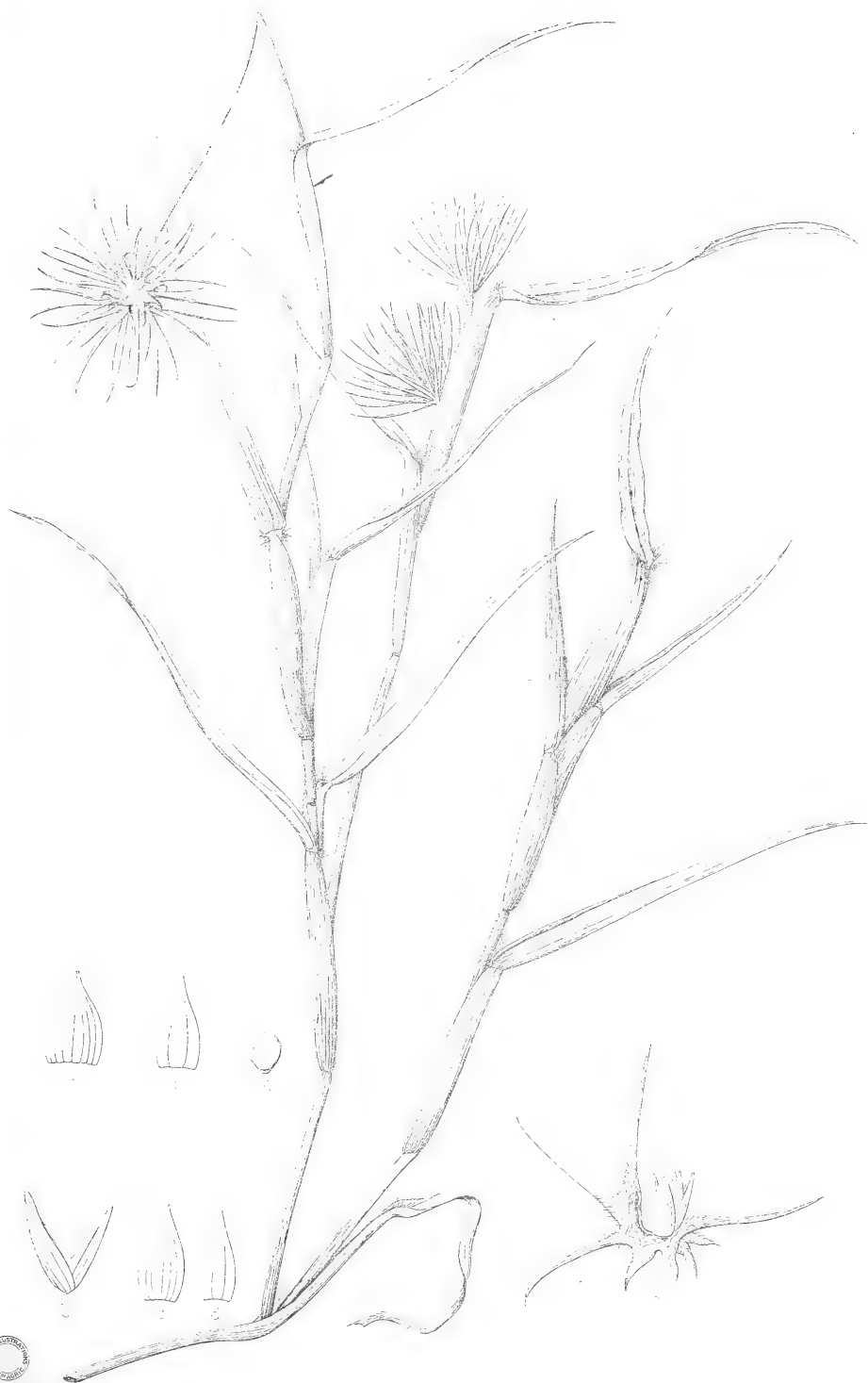
Leaves of culm 4 to 6; sheaths rather loose, scarcely equaling the internodes; blades flat, divaricate, slender-pointed, 3 to 6 inches long, 3 lines wide; ligule a row of soft hairs $\frac{1}{2}$ line long.

Inflorescence in involucre clusters, solitary or 2 to 5 in a second, interrupted spike; involucre indurate, 3 to 5 lines in diameter, cleft on upper side, finely pubescent, bearing yellow or purple spines $\frac{1}{3}$ to $\frac{1}{2}$ inch long, minutely barbed at the points.

Spikelets about 6 in an involucre, 2-flowered (one flower sterile), ovate, acuminate, 2 to 3 lines long; first empty glume ovate, acuminate, scarious and lacerate at apex, minutely scabrid, 5-nerved, 2 to 3 lines long; second glume ovate, obtuse, smooth, thin, 5-nerved, 2 lines long; floral glume of sterile flower ovate, acute, nearly smooth, 5-nerved, 2 to 3 lines long; palet oblong, 2-nerved; floral glume of perfect flower ovate, acuminate, smooth, 7-nerved, 2 lines long; palet ovate, acuminate, smooth, 2-nerved, 2 lines long.

PLATE III; *a*, involucre cut away showing spikelets; *b*, empty glumes; *c*, floral glume of sterile flower; *d*, palet of sterile flower; *e*, floral glume of perfect flower; *f*, palet of perfect flower; *g*, grain.

Lower California and, probably, in southern California. Dr. Palmer says of this species that cattle greedily eat it when young, but when the spines on the involucre begin to harden they give it a wide berth. The injury caused by the burs sticking in sheep's wool more than counterbalances its value as a forage plant.



No. 4.

PHALARIS AMETHYSTINA Trin. Act. Petr. Ser. 6. iii. 56

Plant annual, rather coarse, smooth throughout.

Culms erect, stout, rarely branched, terete, naked above, 2 to 3 feet high.

Leaves of culm 4 to 6; sheaths rather loose, striate, scarious-margined, shorter than the internodes; blades flat, lanceolate, acute, about 9-nerved, 4 to 6 lines wide 3 to 8 inches long; ligule membranaceous, obtuse, 3 lines long.

Inflorescence a dense, oblong, spike-like panicle $\frac{3}{4}$ inch in diameter and 3 to 4 times as long; branches mostly alternate, crowded with short-pediceled spikelets on the numerous divisions.

Spikelets elliptic-obovate, 1-flowered, 3 to $3\frac{1}{2}$ lines long; empty glumes 4; outer pair nearly equal, ovate-oblong, acute, purplish on the margins, minutely hispid on the keel, carinate and narrowly winged above; inner pair hairy, rudimentary scales a line long, rather prominent for the genus; floral glume broadly ovate, acute, coriaceous, finely pubescent, obscurely nerved, $1\frac{1}{2}$ to 2 lines long; palet lanceolate, thin-coriaceous, smooth, slightly cleft at apex, $1\frac{1}{2}$ to 2 lines long.

PLATE IV; *a*, spikelet with empty glumes spread to show inclosed parts; *b*, inner empty glumes and floret with floral glume and palet slightly spread.

California and Oregon.



PHALARIS AMETHYSTINA Torr.



PHALARIS LEMMONI Vasey, Contr. Nat. Herb. iii. 42.

Plant annual, with few, slender roots.

Culm erect, simple, slender, terete, smooth, naked above, 12 to 20 inches high.

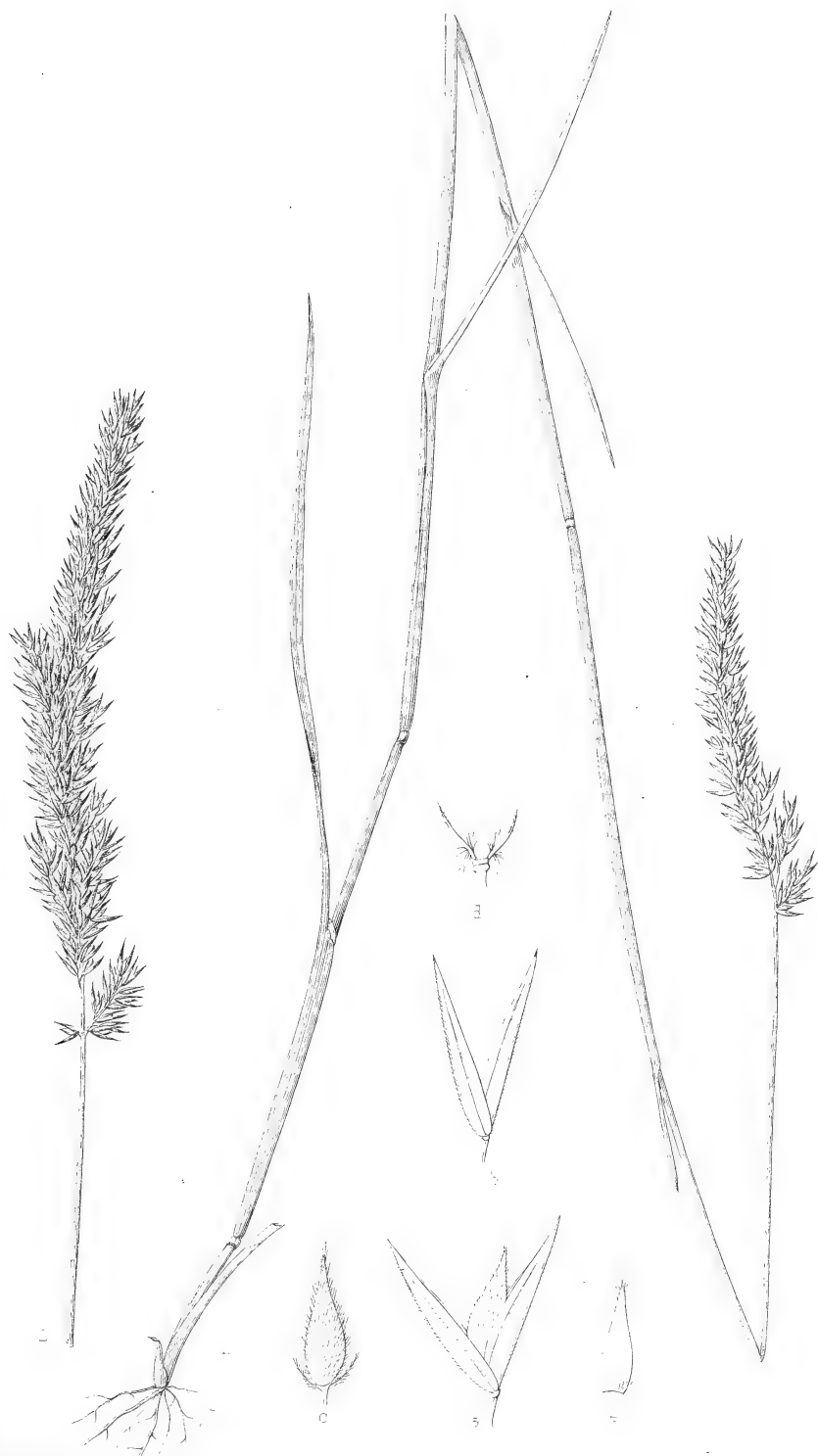
Leaves from the base, with loose, smooth sheaths, and narrow, flat, slightly hispid blades, 3 to 5 inches long. Leaves of culm about 4; sheaths striate, smooth, close, shorter than the internodes; blades flat or folded, hispidulous, acute, erect or but slightly spreading, 1 to 3 inches long; ligule membranaceous, obtuse, 3 lines long.

Inflorescence a close almost spike-like panicle, $1\frac{1}{2}$ to 3 inches long and $\frac{1}{8}$ inch wide; branches mostly alternate, racemose, $\frac{1}{4}$ inch long, crowded with nearly sessile spikelets.

Spikelets obovate, 1-flowered, 2 to $2\frac{1}{2}$ lines long; empty glumes 4; outer pair equal, ovate, acute, carinate but not winged, slightly hispidulous on the three prominent nerves, 2 to $2\frac{1}{2}$ lines long; inner pair inconspicuous, hairy scales appressed to the lower angle of the perfect floret; floral glume broadly ovate, acuminate, clothed throughout with short, appressed, brittle hairs, obscurely nerved, coriaceous, completely enclosing the grain, $1\frac{1}{2}$ lines long; palet ovate, acute, minutely pubescent above, ciliate at apex, obscurely 2-nerved, 1 line long.

PLATE V; *a*, spikelet with empty glumes slightly spread; *b*, outer empty glumes; *c*, floret and inner empty glumes; *d*, inner empty glumes; *e*, palet.

California and Arizona.



PHALARIS LEMMONI Vasey.



HIEROCHLOE MACROPHYLLA Thurb. in Boland. Trans. Cal. Agric. Soc. 1864-5, 132.

Plant perennial, tufted, from a slender or often knotted rootstock.

Culm erect, slender, rarely branched above the base, usually naked above and slightly hispid, 2 to 3 feet high.

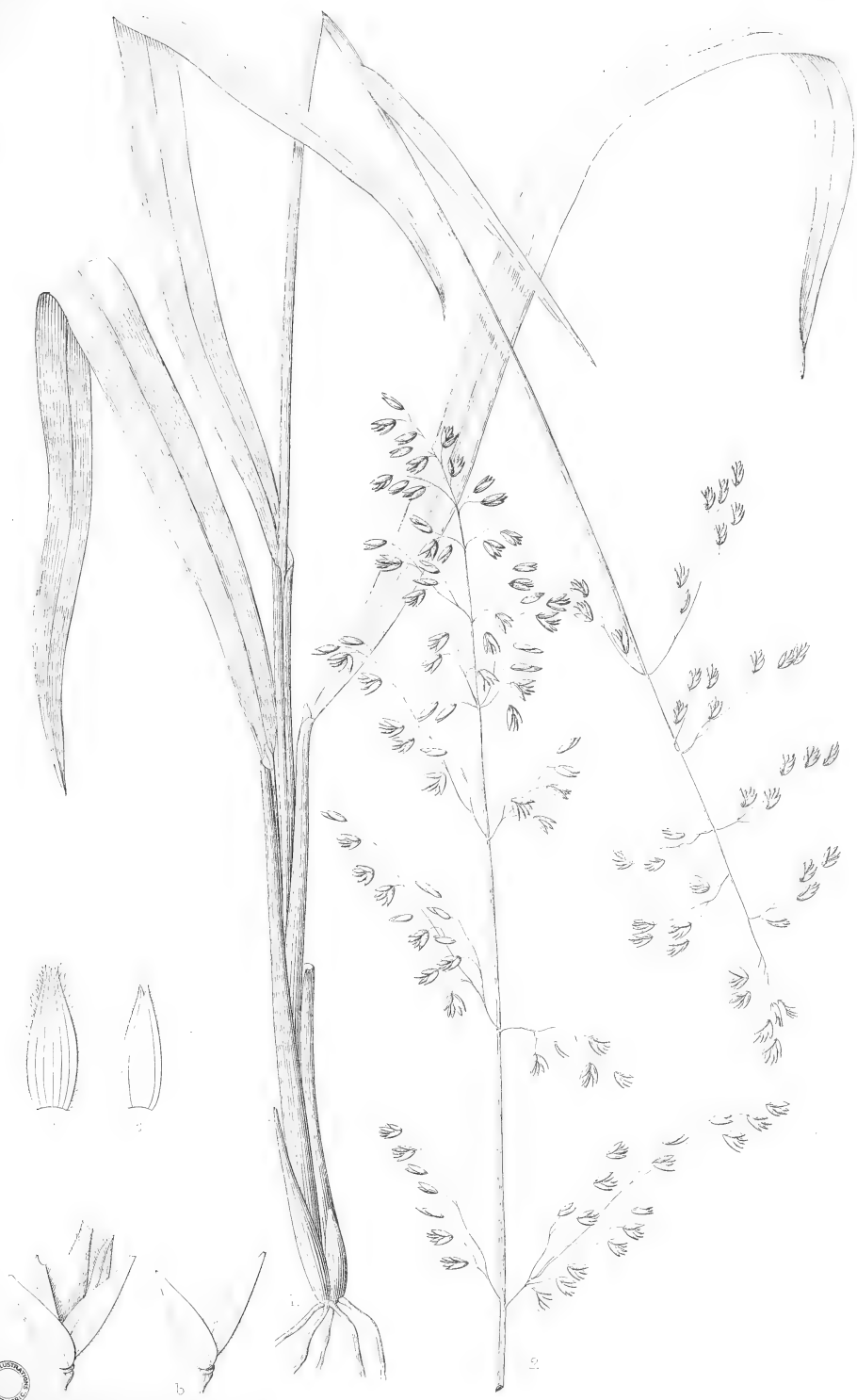
Leaves of culms 3; sheaths mostly open above, striate, nearly smooth, equaling or exceeding the internodes; blades flat, tapering to both ends, hispidulous above and beneath, cross veins between the nerves rather prominent, 4 to 6 lines wide and 6 to 12 inches long; ligule membranaceous, usually purple, 2 to 3 lines long.

Inflorescence an open panicle, 3 to 6 inches long; branches spreading or reflexed, mostly in twos, slender, flexuose, lower ones 2 to 3 inches long, bearing 4 to 6 pedicellate spikelets beyond the middle.

Spikelets obovate, 3-flowered (only the upper flower maturing seed), 2 to $2\frac{1}{4}$ lines long; first empty glume broadly ovate, acute, carinate, thin, smooth, purplish, 3-nerved at base, $1\frac{1}{2}$ to 2 lines long; second empty glume same but $\frac{1}{3}$ line longer and slightly hispid on the keel; floral glume broadly oblong, obtuse or emarginate and mucronulate, ciliate, pubescent on back near apex, 5-nerved, $1\frac{1}{2}$ to 2 lines long, upper one at maturity slightly indurated and shining; palea oblong-linear, cleft at apex, thin, pubescent on the 2 nerves, $1\frac{1}{4}$ to $1\frac{1}{3}$ lines long; grain triangular in cross section, tapering to each end, brown, opaque, 1 line long.

PLATE VI; *a*, spikelet enlarged about 5 times; *b*, empty glumes; *c*, floral glume; *d*, palea.

California and Oregon. Furnishes a large amount of foliage, and is probably of agricultural value.



HIEROCHLOA MACROPHYLLA Thunb.

ARISTIDA CALIFORNICA Thurb. Bot. Cal. ii. 289.

Plant apparently annual in sandy soil and perennial in rocky soil, tufted with coarse roots.

Culm geniculate, spreading or nearly erect, slender, repeatedly branched, clothed with short, dense pubescence and villous at the nodes or smooth, 6 to 12 inches high.

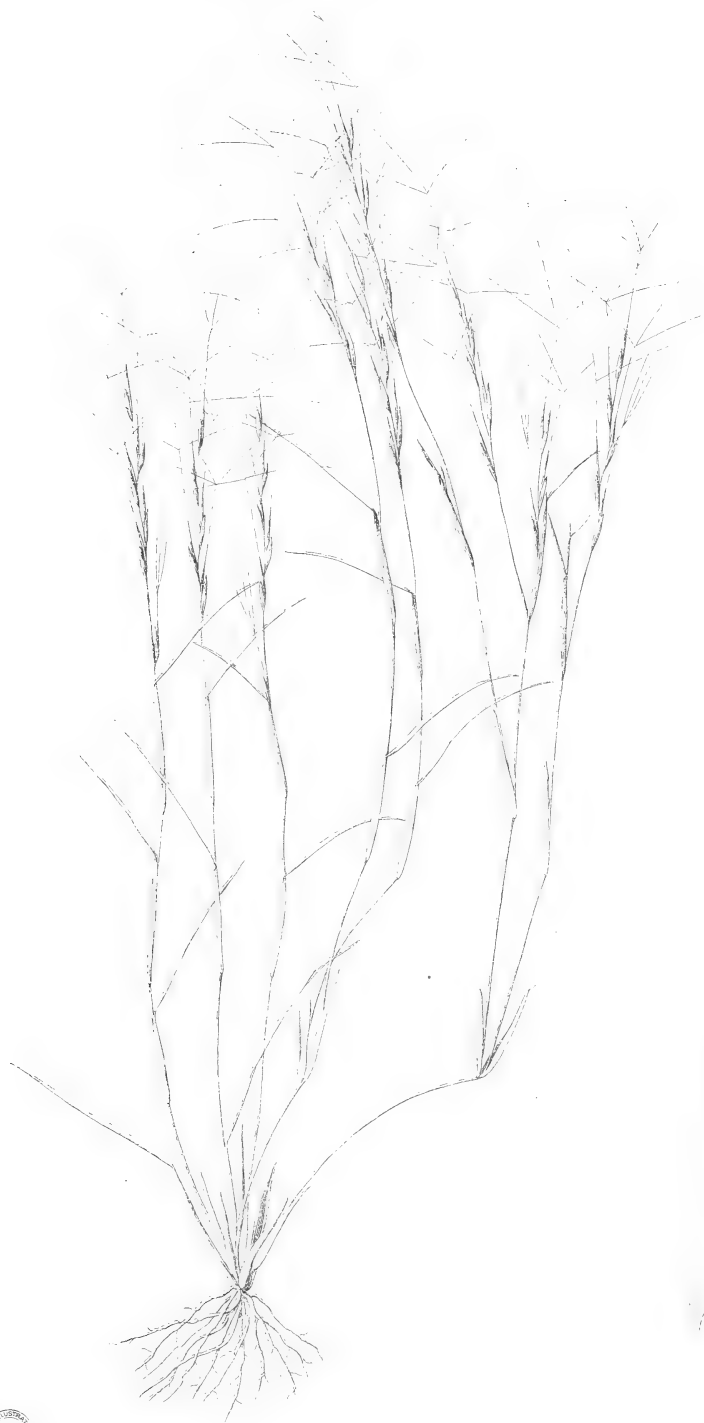
Leaves from the base numerous, with scarious, overlapping sheaths and short, flat or convolute blades. Leaves of culm 3 or 4; sheaths striate, smooth, shorter than the internodes; blades convolute, slender, sharp-pointed, hispidulous below, minutely pubescent above, $\frac{1}{2}$ to 2 inches long.

Inflorescence a slender raceme of 8 to 15 appressed spikelets, lower ones in twos, one sessile and one pedicellate.

Spikelets 1-flowered, 6 to 7 lines long; empty glumes linear-lanceolate, lacerate at the apex, usually purple with white scarious margins, smooth or minutely hispid on the keel; first glume $3\frac{1}{2}$ to 4 lines long; second glume 6 to 7 lines long; stipe slender, nearly a line long; awn articulated, deciduous, hispid, usually purple, common stalk twisted, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, branches slender, divergent, equal, 1 to $1\frac{1}{2}$ inches long; palea inconspicuous, less than $\frac{1}{2}$ line long; grain narrow, cylindrical, light yellow, opaque, 2 to $2\frac{1}{4}$ lines long.

PLATE VII; *a*, spikelet enlarged to twice its real size; *b*, empty glumes; *c*, floret; *d*, floret and base of awn much enlarged.

Southern California and Arizona. This species is evidently a perennial in clefts of rocks and in protected places in the mountains, and quite as evidently an annual in regions of loose sand. An extreme variation of this latter form is *A. Californica* Thurb. var. *fugitiva* Vasey, which differs from the type chiefly in the shorter internodes, more abundant short branches, giving it a densely bushy form, looser panicle of fewer spikelets and longer empty glumes (7 to 9 lines). The roots having but a slight hold in the sand it is torn up and driven across the plains by the wind like a tumbleweed.



S. Mearns, Del. Boston

ARISTIDA CALIFORNIA *Thurb.*

T. Holm del.

STIPA CORONATA Thurb. Bot. Cal. ii. 287.

Plant coarse, perennial, tufted; roots coarse and strong.

Culm erect, terete, minutely hispid, naked above, 3 to 6 feet high, $\frac{1}{4}$ inch thick at base where it is clothed with the remains of several weather-worn sheaths.

Leaves from the base with rather scarious, smooth sheaths 3 to 6 inches long and blades flat or involute with slender, convolute points, smooth below, hispid above, 3 to 5 lines wide at base, 2 to 3 feet long. Leaves of culm 3 to 5; sheaths smooth except the ciliate throat, equaling or exceeding the internodes; blades like those of the radical leaves 1 to 2 feet long; ligule, lacerate or fringed, $\frac{1}{4}$ line long.

Inflorescence a narrow, rather dense, virgate panicle, 12 to 16 inches long, at first spike-like and included in the upper sheath; branches mostly in fascicled clusters of 4 or more, 2 to 3 inches long, erect and bearing pedicellate spikelets to the base, or the lower branches fewer and spikelet bearing only beyond the middle.

Spikelets lanceolate, turgid, 8 to 10 lines long; empty glumes appressed, lanceolate, slender-pointed, herbaceous below, often purple or purplish with membranaceous margins; first glume 3-nerved, 8 to 10 lines long; second glume a line shorter and 5-nerved; stipe curved, acute, white, bearded above, $\frac{1}{3}$ line long; floret spindle-shaped, 4 lines long, $\frac{2}{3}$ line thick; floral glume clothed with silky white hair a line long, longer and somewhat tufted at the apex, obscurely 5-nerved; awn often purplish, twisted, nearly naked, slightly bent; palea oblong, lacerate at the obtuse apex, $1\frac{1}{2}$ to 2 lines long; lodicules minute; anthers naked; grain spindle-shaped, widest below, reddish, nearly opaque, 3 lines long, $\frac{1}{2}$ line thick.

PLATE VIII; *a*, spikelet dissected and enlarged about twice.

Arizona and southern California in the valleys or lower levels near water. One of the largest of North American Stipas.



STIPA CORONATA *Thurb.*



STIPA EMINENS Cav. Ic. Pl. v. 42. t. 467.

Plant perennial, tufted.

Culms erect, slender, terete, hispidulous, pubescent near the nodes, 2 to 4 feet high; lower internodes short, covered with weather-worn sheaths.

Leaves of culm 3 or 4; sheaths rather loose, striate, nearly smooth, shorter than the internodes; blades of lower leaves closely convolute-filiform, 6 to 10 inches long, of upper leaves less convolute, hispid on both surfaces, slender-pointed, 3 lines wide, 4 to 6 inches long; ligule membranaceous, truncate, erose, decurrent, $\frac{1}{4}$ line long.

Inflorescence a slender, flexuous or nodding, secund panicle, rather loose, often included at base; branches in fives, threes or twos, usually pubescent at the axils, slender, flexuous, the longer ones (3 to 4 inches) racemose and bearing 6 to 10 spikelets beyond the middle, the shorter branches spikelet-bearing to the base.

Spikelets pedicellate, 1-flowered, 5 to 6 lines long; empty glumes divergent, lanceolate, subulate-pointed, membranaceous, smooth, purple or nearly white; first glume 3-nerved, 4 to 6 lines long; second glume a line shorter and 5-nerved; stipe curved, acute, bearded, $\frac{1}{3}$ line long; floret spindle-shaped constricted to a slight neck below the apex, $2\frac{1}{2}$ to 3 lines long, $\frac{1}{3}$ line thick; floral glume thin, chartaceous, clothed with short, appressed pubescence (slightly longer at the minutely bidentate apex), 5-nerved; awn twisted, minutely pubescent, bent, 1 to $1\frac{1}{2}$ inches long; palea broadly ovate, acute, $\frac{2}{3}$ line long; lodicules less than $\frac{1}{2}$ line long; anthers slightly bearded or naked; grain spindle-shaped, light brown.

PLATE IX; *a*, spikelet enlarged twice; *b*, empty glumes; *c*, floral glume and its apex much enlarged; *d*, palea.

Southern and Lower California, confined mostly to the coast ranges and foothills.



STIPA EMINENS Cav.



STIPA KINGII Boland. Proc. Cal. Acad. iv. 170.

Plant perennial, caespitose at base, with numerous root-fibers.

Culm erect, simple, terete, smooth, naked above, with but two nodes near the base which are covered with the remains of many sheaths, 5 to 12 inches high.

Leaves from the base numerous with membranaceous sheaths 1 to $1\frac{1}{2}$ inches long, and closely convolute, filiform, scabrous blades 4 to 12 inches long. Leaves of culm 2; lower one like the radical leaves, and upper one with close, striate, smooth sheath 3 to 6 inches long, and blade not exceeding the lower leaves; ligule membranaceous, acute, often cleft, decurrent.

Inflorescence a narrow, erect or flexuous panicle 2 to 5 inches long; branches mostly in twos or threes, erect, scabrous, an inch or less long, bearing 1 to 3 pedicellate spikelets.

Spikelets oblanceolate, 1-flowered, 2 lines long; empty glumes elliptical, entire, erose, or sometimes mucronate at the apex, hyaline above, purple below, midnerve obscure, lateral nerves not manifest; first glume $1\frac{1}{2}$ lines long, equaling the floret; second glume half a line longer; stipe obconical, scarcely acute, short-bearded, about $\frac{1}{8}$ line long; floret spindle-shaped, $1\frac{1}{2}$ lines long and $\frac{1}{4}$ as thick; floral glume ovate, minutely 2-toothed at the apex, chartaceous, brownish purple, clothed with a short pubescence slightly longer at the apex, obscurely 5-nerved, $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long; awn persistent, finely pubescent, loosely twisted and somewhat bent below the middle; palea broadly ovate, obtuse, membranaceous, purple, slightly pubescent at the apex, 1 to $1\frac{1}{4}$ lines long; lodicules minute or wanting; anthers bearded at the apex; grain oblong, slightly broader above, somewhat flattened, reddish with a yellow apex, nearly opaque, 1 line long and nearly $\frac{1}{3}$ as thick.

PLATE X; *a*, spikelet enlarged 6 times; *b*, empty glumes; *c*, floret; *d*, palea.

California and Nevada. This is one of the species near the dividing line between *Stipa* and *Oryzopsis*.



STIPA KUNIGII Agardh.



STIPA OCCIDENTALIS Thurb. in Watson, Bot. King Exped. 380.

Plant perennial with cespitose, almost bulbous base, smooth and glaucous or with short, retrorse pubescence, especially below.

Culms erect, simple, slender, terete, 12 to 20 inches high.

Leaves from the base, with scarious, usually reddish sheaths, and narrow, filiform-convolute, sharp-pointed, hispid blades 2 to 6 inches long. Leaves of culm 2 or 3; sheaths close, striate, hispid, closely pubescent or nearly smooth, shorter than the internodes; blades closely convolute, almost setaceous, 1 to 2 inches long; ligule prominent, exserted, lacerate, 2 to 2½ lines long.

Inflorescence a slender, erect panicle 3 to 4 inches long, often included at base; branches mostly in twos, usually erect, 1 to 2 inches long, bearing 2 or 3 pedicellate spikelets.

Spikelets lanceolate, turgid, 1-flowered, 4½ to 6 lines long; empty glumes appressed, lanceolate, acute, thin, purplish below, membranaceous above, smooth; first glume obscurely 5- to 7-nerved at base, 5 to 6 lines long; second glume about a line shorter and 3-nerved; stipe obconical, scarcely curved, acute, pubescent, ½ line long; floret spindle-shaped, tapering to apex, 3 lines long, ½ line thick; floral glume thin, chartaceous, pubescent, plainly 5-nerved; awn articulated, persistent, flattened, twisted, plumose on lower half, bent at middle, 1½ to 2 inches long; palea oblong, boat-shaped, pubescent on back and at obtuse apex, 2-nerved, 2 to 2½ lines long; anthers naked; lodicules minute; grain spindle-shaped, reddish with a longitudinal white line on ventral side, slightly opaque, 2¼ lines long and ⅓ line thick.

PLATE XI; *a*, spikelet partly dissected, enlarged about three times.

Common in the Sierras and Cascade ranges from central California to Washington and extending into western Nevada. Mr. Bolander states that this species is much esteemed by sheep-growers.



STIPA OCCIDENTALIS Thurb.

Fl. Californ.

STIPA PARISHII Vasey, Bot. Gaz. vii. 32.

Plant perennial, tufted, somewhat bulbous, with coarse, woolly roots.

Culm erect, simple, terete, hispid, thickly clothed at base with persistent sheaths, rarely naked above, 1 to 1½ feet high.

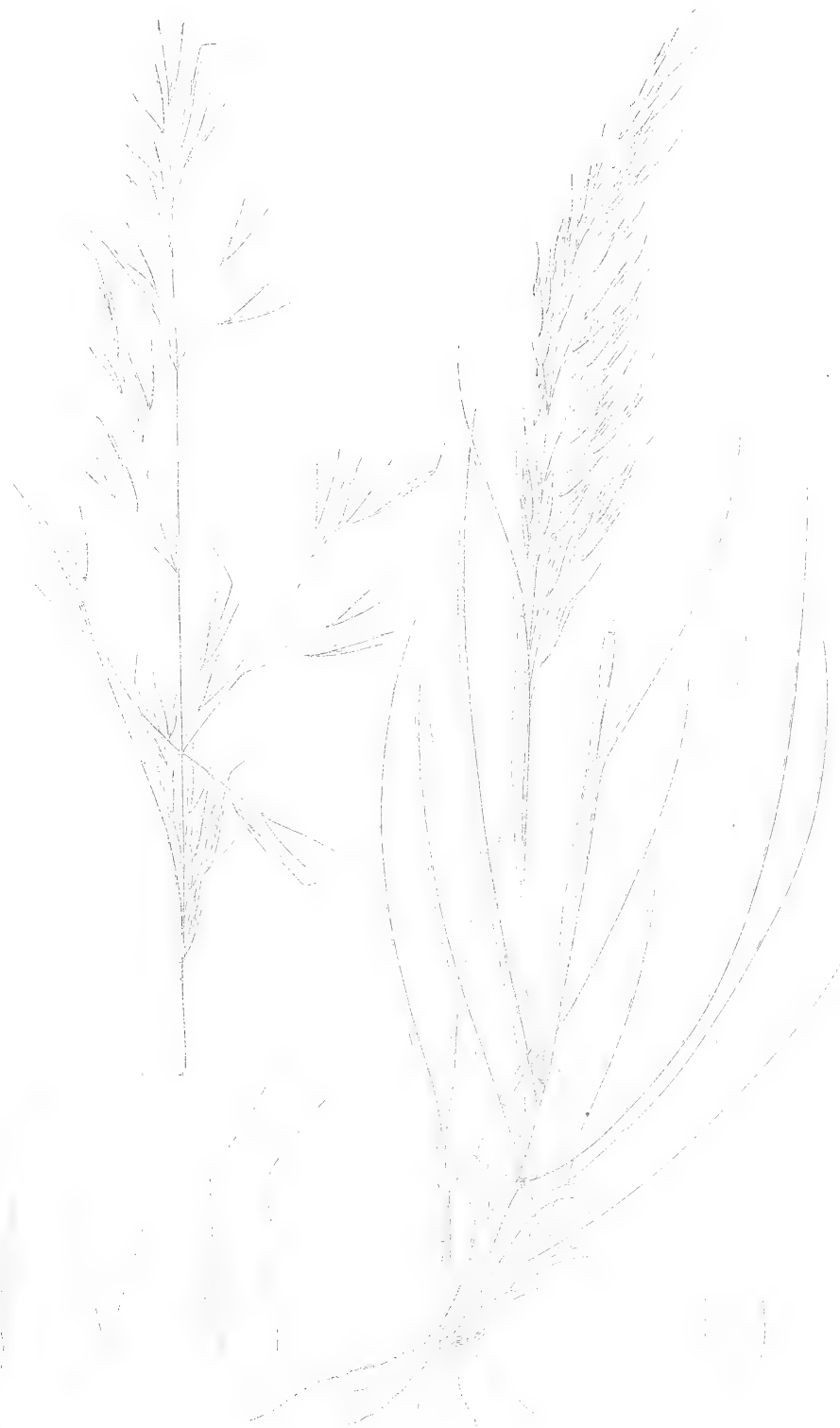
Leaves of the culm 4 or 5 crowded below with short, overlapping smooth or scabrous sheaths, white-hairy at the throat, and divergent conduplicate or involute blades, smooth below and hispid above, 6 inches long; upper sheaths longer and vaginate, inclosing the lower part of the panicle, with a narrow, convolute, nearly erect blade, 3 inches long; ligule very short.

Inflorescence a rather open, erect panicle 5 to 8 inches long; branches in twos or threes, 2 inches or less long, bearing 5 to 10 spikelets on slender branchlets.

Spikelets 1-flowered, 6 to 7 lines long; empty glumes spreading, lanceolate, slender-pointed, concave, rather thick, smooth; first glume 3-nerved 6 to 7 lines long; second glume a line shorter and 5-nerved, the lateral nerves often obscure; stipe curved, slender, acute, yellow-bearded at the middle, ½ line long; floret spindle-shaped, 2½ to 3 lines long, less than ½ line thick; floral glume bidentate at apex with two naked, hyaline teeth ⅔ line long, densely clothed elsewhere with stiff, white hairs 2 lines long, chartaceous, obscurely 5-nerved; awn smooth below, scabrous above, 9 lines long; palea oblong, barely acute, boat-shaped, pubescent, with long hairs between the 2 nerves, adherent to the grain; lodicules narrow, 1 line long; anthers naked; grain spindle-shaped, tapering to the beaked apex, nearly terete, light brown or olive, 2 lines long, ⅓ line thick.

PLATE XII; *a*, spikelet enlarged twice; *b*, empty glumes; *c*, floret; *d*, floral glume opened showing the teeth at the apex; *e*, palea, side and back views.

Mountains of southern and Lower California.



STIPA SETIGERA Presl. Rel. Hænk. i. 226.

Plant perennial, tufted, somewhat bulbous at base.

Culms erect, slender, terete, slightly hispid or smooth, pubescent at the nodes, 2 to 3 feet high.

Leaves from the base, narrow, filiform-involute, 10 to 20 inches long. Leaves of culm usually 3; lower sheaths close and shorter than the internodes, upper ones usually loose and longer, hispidulous, often ciliate at the throat; blades flat or involute, 2 lines wide at base, hispid on both surfaces or nearly smooth below, 6 to 10 inches long; ligule membranaceous, obliquely truncate, 1 line long.

Inflorescence a loose, flexuous panicle 6 to 12 inches long, usually included at the base; branches mostly in pairs or threes, often pubescent at the axils, spreading, flexuous, subdivided, and bearing on scabrous pedicels 3 to 12 spikelets beyond the middle, or the shorter ones spikelet-bearing nearly to the base.

Spikelets lanceolate, 1-flowered; empty glumes slightly spreading, narrowly-lanceolate, convex and purple below, carinate, white and membranaceous above, slightly hispid on the keel, 3-nerved or the upper rarely 5-nerved, 6 to 9 lines long, nearly equal or the upper 1 to 2 lines shorter; stipe curved, acute, bearded, 1 line long; floret spindle-shaped, constricted below the ciliate apex, gibbous 3 to 4 lines long, $\frac{2}{3}$ line thick; floral glume chartaceous, tuberculate-roughened, clothed with appressed brittle hairs, naked except the nerves at maturity, 5-nerved; awn pubescent, especially below, purple or gold-color, flexuous, 3 inches long; palea ovate, $\frac{2}{3}$ line long; lodicules minute; anthers bearded at apex; grain spindle-shaped, light yellow, $2\frac{1}{4}$ lines long.

PLATE XIII; *a*, spikelet enlarged about twice; *b*, empty glumes; *c*, floret.

California, chiefly south of the Sacramento Valley. It has evidently been confused with *S. eminens* and *S. leucotricha*, and has thus been spoken of as having a wider range. Prof. Brewer speaks of it as a valuable "bunch-grass" of the dry foothills.



STIPA SETIGERA Presl.

STIPA SPECIOSA Trin. and Rupr. Stipaceae, 45.

Plant perennial, with cespitose, bulbous base, and coarse woolly roots.

Culms erect, simple, terete, smooth or slightly hispid, 1 to 2 feet high.

Leaves from the base numerous, with mostly scarious, reddish sheaths, smooth or velvety-pubescent and filiform-convolute, smooth or slightly scabrous blades, 5 to 12 inches long. Leaves of the culm usually 3; sheaths rather loose, upper one vaginate and inclosing the lower part of the panicle, striate, scabrous, nearly as long as the internodes; blades slender-pointed, less convolute and shorter than those of the radical tuft; ligule a short fimbriate membrane.

Inflorescence a narrow, erect, strict panicle, 3 to 7 inches long, included at first; branches mostly in twos or threes, unequal, the shorter spikelet-bearing to the base, the longer bearing about 6 pedicellate spikelets beyond the lowest third.

Spikelets spindle-shaped, 1-flowered, 7 to 8 lines long; empty glumes lanceolate, slender-pointed, often lacerate near the apex, membranaceous above, smooth, 7 to 8 lines long; first glume 3-nerved; second glume 5-nerved; stipe curved, slender-pointed, bearded, $\frac{2}{3}$ to 1 line long; floret narrowly spindle-shaped, $3\frac{1}{2}$ lines long and about $\frac{1}{2}$ line thick; floral glume chartaceous, clothed with rather stiff pubescence, which is slightly longer and scarcely tufted at the apex, obscurely 5-nerved; awn articulated, often deciduous, sharply bent at the middle, twisted and copiously plumose below, smooth, slender, and dark-colored above, 2 inches long; palea oblong, obtuse, boat-shaped, pubescent between the 2 nerves, $2\frac{1}{2}$ lines long; anthers exserted, naked; lodicules slender, a line long; grain spindle-shaped, yellow, with a white line on the ventral side, opaque, 3 lines long.

PLATE XIV; *a*, spikelet partly dissected, enlarged twice.

California, extending east to Arizona and southern Utah. Throughout the same range is found *S. speciosa*, var. *chrysophylla*, which may include several variable forms, usually referred to *S. chrysophylla*. It is generally only 6 to 10 inches high, with a panicle 2 to 4 inches long, the parts of the spikelet varying to slightly smaller than those of the species.



STIPA NEOCOSA Trin.

STIPA STILLMANI Boland. Proc. Cal. Acad. iv, 169.

Plant perennial, tufted from thick bulbous base or clusters of almost woody tubers root-fibers tomentose.

Culms erect, terete, glaucous, smooth, 3 to 5 feet high, nodes pubescent.

Leaves from the base and of sterile shoots numerous; sheaths rather loose, open above, striate, smooth, ciliate at throat; blades flat or involute, slender-pointed, smooth below, hispid above, 2 to 3 lines wide, 12 to 18 inches long. Leaves of culm 4 or 5; sheaths much shorter than internodes; blades similar to those of radical leaves or the upper ones shorter; ligule thick, scarious, velvety-fringed, $\frac{1}{4}$ line long.

Inflorescence an erect, narrow panicle interrupted below, dense above, 6 to 10 inches long; branches in fives, threes, and twos, unequal in fuscous-pubescent tufts on the rachis, 1 inch long or less, 2- to 5-flowered.

Spikelets pedicellate, lanceolate, 1-flowered, 7 to 8 lines long; empty glumes nearly equal, lanceolate, subulate-pointed, membranaceous silvery-white, minutely appressed-pubescent, 7 to 8 lines long; first glume 3-nerved; second glume 5-nerved at base; all except the excurrent, scabrous, middle nerve in each, evanescent; stipe obconical, obtuse, bearded above, $\frac{1}{3}$ line long; floret spindle-shaped, tapering to the apex, 4 lines long, $\frac{1}{2}$ to $\frac{2}{3}$ line thick; floral glume lanceolate, with two slender ciliate teeth a line long at the apex, pubescent, very obscurely 5-nerved; awn whitish, slightly pubescent and twisted below, bent at the middle, 1 inch long; palea lanceolate, cleft at the apex, boat-shaped or wrapped completely around the stamens, slightly pubescent on the back above, 2-nerved, $3\frac{1}{2}$ to 4 lines long; stamens $2\frac{1}{2}$ lines long, 2-horned at apex, but not bearded; lodicules lanceolate, acute, half a line long.

PLATE XV; a, spikelet enlarged about twice.

Collected in 1870 in the Sierra Nevada Mountains by H. N. Bolander; not reported since.



STIPA STILLMANI Boland

W.F. Sells, del.



B. Mead, San Francisco

STIPA STRICTA Vasey, Bull. Torr. Club, x. 42.

Plant perennial, somewhat caespitose.

Culm erect, simple, slender, terete, pubescent at the nodes, 1 to 1½ feet high.

Leaves from the base, with short sheaths and narrow involute blades 10 to 15 inches long. Leaves of the culm 2 or 3; sheaths rather loose, striate, minutely hispid, longer than the internodes; blades conduplicate or involute, 1 to 2 lines wide, 3 to 6 inches long; ligule membranaceous, lacerate, the lateral teeth longer.

Inflorescence a narrow, erect panicle included below in the upper sheath; branches mostly in twos or threes or upper ones single, appressed, unequal, 1 inch long or less, the longer branched and bearing 3 to 5 spikelets beyond the middle.

Spikelets oblanceolate, narrow, 5 to 6 lines long; empty glumes appressed, lanceolate, slender-pointed, convex and herbaceous below, thin-membranaceous and carinate above, sometimes purplish, 3-nerved, or both sometimes 5-nerved at base; first glume 5½ to 6 lines long; second glume usually half a line shorter; stipe slender, curved, acute, short-bearded, ½ line long; floret spindle-shaped, 2½ to 3 lines long, ⅓ line thick; floral glume thin, chartaceous, with 2 ciliate teeth ½ line long at the apex, clothed throughout with close, short pubescence, 5-nerved; awn twisted and pubescent below, naked above, usually bent twice, 1½ to 2 inches long; palea lanceolate, cleft or erose-dentate at the apex, pubescent between the 2 nerves, 1¼ lines long; lodicules slender, ⅔ line long; anthers naked; grain spindle-shaped, olive-brown, 2½ lines long.

PLATE XVI; *a*, panicle; *b*, spikelet partly dissected enlarged 3 times.

In the Sierra Nevada Mountains from central California to Washington. Probably a good species for sheep pastures.



a.

STIPA STRICTA Vasey.

W. F. Schott, del.



ORYZOPSIS EXIGUA Thurb. Bot. Wilkes Exp. 481.

Plant perennial, tufted, with numerous sterile shoots.

Culms erect, slender, terete, hispid, 6 to 15 inches high; nodes black, scarcely constricted.

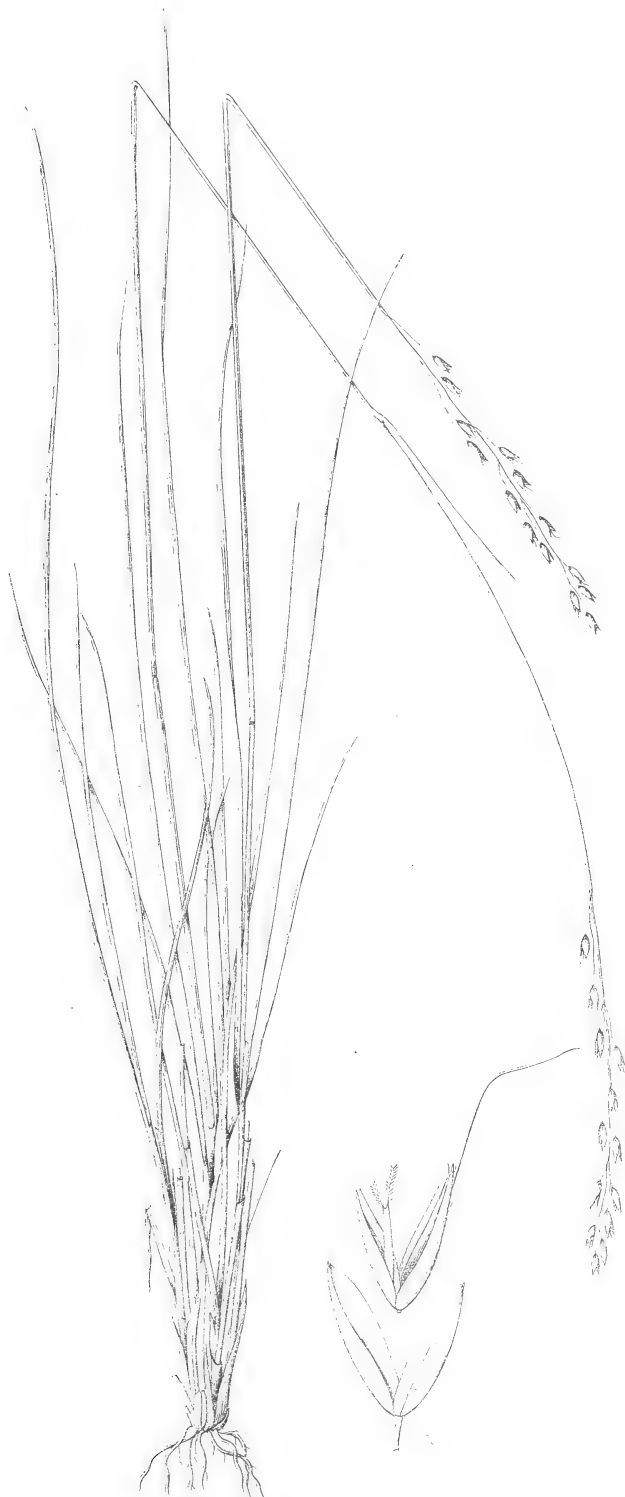
Leaves of sterile shoots numerous, with close striate, hispid sheaths, and narrow involute, wiry, scabrous blades 4 to 7 inches long. Leaves of culm usually 4; lower two with short, overlapping sheaths and blades like the radical leaves, next sheaths above much shorter than the internode, upper sheath usually vaginate and longer, upper blades erect, 2 to 4 inches long; ligule membranaceous, acute, 1 to 2 lines long.

Inflorescence a narrow secund panicle included at first, $1\frac{1}{2}$ to 3 inches long; rachis flexuous, branches usually in pairs, erect, unequal, the longer bearing usually 2 spikelets and the shorter one.

Spikelets lanceolate, turgid, 1-flowered, $2\frac{1}{2}$ lines long; empty glumes oblong-ovate, barely acute or abruptly acuminate, membranaceous, minutely scabrous, equal, 2 to $2\frac{1}{2}$ lines long, 3-nerved or 5-nerved at the base, the nerves anastomosing; stipe short, blunt; floret spindle-shaped, 2 to $2\frac{1}{2}$ lines long, $\frac{1}{4}$ as thick; floral glume herbaceous, becoming chartaceous, obtuse or with purple teeth at the apex, clothed throughout with short pubescence, 5-nerved, the nerves uniting above; awn persistent, minutely hispid, brown, 2 to 3 lines long; palea equaling the glume and like it in texture and pubescence, obtuse or bidentate at the apex; lodicules 2, $\frac{1}{2}$ line long; anthers exerted; grain oblong, flattened, oblique at the obtuse apex, yellow, minutely wrinkled, $1\frac{1}{4}$ lines long, $\frac{1}{3}$ as wide.

PLATE XVII; a, spikelet partly dissected, enlarged 5 times.

Oregon and Washington, in the mountains. The persistent awn and elongated floret of this species place it close to *Stipa*, and indicate that it is difficult to make even an artificial distinction between the two genera.



ORIZOPSIS EXTENSA. Torr.

W. P. S. Hilleb. del.



ORYZOPSIS WEBBERI (Thurb.) Vasey, Bull. Torr. Club, xv. 49.

Plant perennial, densely caespitose.

Culms erect, slender, thickened at the base, wiry, terete, hispidulous, 3 to 9 inches high, covered at base with numerous scarious, brown, shiny, smooth sheaths, naked only below the upper sheath.

Leaves from the base numerous, filiform-convolute, rigid, scabrous, often ciliate near the base, 3 to 4 inches long. Leaves of culm 2 or 3 below, and 1 or often 2 or 3 somewhat fascicled above; lower sheaths close, slightly hispid, overlapping, with blades like those of the radical leaves but not exceeding them; upper sheath or fascicle of sheaths dilated, nearly smooth, with an erect, convolute, rigid, deciduous blade scarcely equaling the panicle; ligule obscure or the upper ones membranaceous, oblique, less than $\frac{1}{4}$ line long.

Inflorescence a narrow, somewhat secund panicle, or often of 2 to 4 nearly equal erect branches $1\frac{1}{2}$ to 3 inches long, included at base, rays in twos or threes, erect, bearing one or two spikelets on clavate pedicels.

Spikelets oblanceolate, 1-flowered; empty glumes spreading, lanceolate, acuminate, membranaceous above, often purple-tinged, smooth, 3-nerved, equal, 4 lines long; stipe oblique, obconical, acute, bearded throughout like the glume, $\frac{1}{4}$ line long; floret spindle-shaped, $2\frac{1}{4}$ to $2\frac{1}{2}$ lines long, $\frac{1}{2}$ line thick; floral glume coriaceous, yellow when mature, densely clothed throughout with erect, white, persistent hairs 1 to $1\frac{1}{2}$ lines long, 5-nerved, the lateral nerves uniting with the midnerve above; awn minutely scabrous, twisted, bent, 3 to 5 lines long, caducous; palea 2 lines long, chartaceous and bearded like the glume, especially above; lodicules 2, linear, 1 line long; anthers naked; grain broadly spindle-shaped, nearly smooth, dark brown, opaque, nearly 2 lines long and $\frac{1}{4}$ as thick.

PLATE XVIII; *a*, spikelet enlarged 3 times; *a'*, spikelet before the awn has dropped; *b*, empty glumes; *c*, floret; *d*, palea.

California and Nevada. A rare species, reported by but two or three collectors.



ORYZOPSIS WEBBERI (Thurb) Vasey.

MUHLENBERGIA CALAMAGROSTIDEA Kth. Gram. i. 63.

Plant annual, loosely tufted, often purplish throughout.

Culms geniculate below, erect, branching, slender, striate, nearly smooth, 1 to 3 feet high.

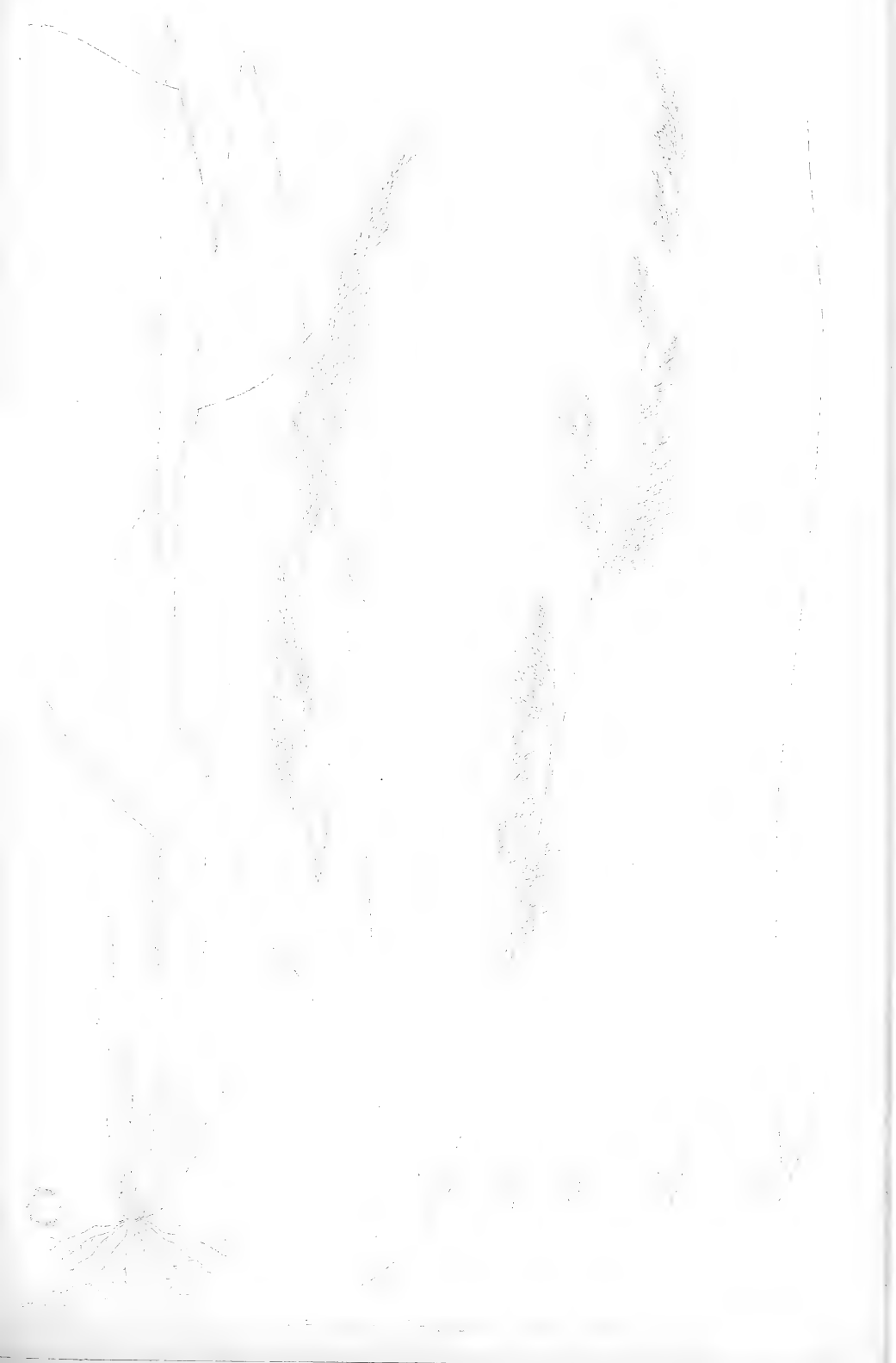
Leaves of culm 3 to 5; sheaths close, slightly hispidulous, shorter than the internodes; blades flat or involute, hispidulous, a line wide, 1 to 2 inches long; ligule membranaceous, lacerate or cleft nearly to the base into two or more linear divisions $1\frac{1}{2}$ lines long.

Inflorescence a rather loose, narrow, erect or flexuous, interrupted panicle 5 to 8 inches long; branches alternate, ascending, $1\frac{1}{2}$ inches long or less, slightly exceeding the intervals, racemose and spikelet-bearing to the base.

Spikelets nearly sessile or on short hispid pedicels, 1-flowered, $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long; empty glumes persistent, divergent, lance-ovate, acute, subulate-pointed or minutely bidentate and mucronate, membranaceous, hispid on the keel, 1-nerved; first glume $\frac{1}{2}$ to 1 line long; second glume $\frac{1}{4}$ line longer; floret deciduous, spindle-shaped, acute, $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long; floral glume ovate, bidentate, membranaceous, usually dotted with purple, minutely roughened, finely pubescent at the base, 3-nerved, the lateral nerves marginal, the middle nerves obscure, excurrent in a slender flexuous awn 6 to 10 lines long; palea lance-ovate, acute, purple-dotted like the glume, finely pubescent at the base, 2-nerved, 1 line long; grain nearly terete, tapering to the apex, reddish-brown, $\frac{3}{8}$ line long.

PLATE XIX; *a*, spikelet enlarged about 10 times; *b*, empty glumes; *c*, floral glume; *d*, palea.

Chiefly Mexican, but extending into Arizona and southern California.



MUHLENBERGIA CALIFORNICA Vasey, Bull. Torr. Club, xiii. 53.

Plant perennial, with strong creeping rootstock, green, often glaucous.

Culms ascending, geniculate and branching below, terete, lower internodes naked, smooth and shining, waxy-pubescent near the nodes, hispid below the panicle, 2 to 2½ feet high.

Leaves of culm 8 to 11; lower with open sheaths and short divaricate blades, often fascicled; middle and upper with close, striate, hispid sheaths exceeding the internodes and flat, hispid blades ¼ inch wide and 3 to 5 inches long; ligule membranaceous, lacerate, nearly 1 line long.

Inflorescence a close almost spike-like panicle, 3 to 5 inches long, interrupted below; branches alternate, nearly erect, pubescent, slightly exceeding the intervals, lower ½ to 1½ inches long, with the nearly sessile spikelets crowded on the short, appressed subdivisions.

Spikelets oblanceolate, compressed, 1-flowered, 1½ to 2 lines long; empty glumes lance-ovate, acuminate and subulate-pointed or obtuse and mucronate in the same specimen, carinate, minutely scabrous, membranaceous except the green hispid keel, 1-nerved, nearly equal, 1½ to 2 lines long; floral glume ovate, acute, or minutely bidentate at the apex, finely scabrous, sparingly villous near the base, 3-nerved, lateral nerves extending to the apex but not marginal, midnerve excurrent in a minutely hispid awn ½ to 1½ lines long; palea ovate, acute, thin, villous between the 2 nerves below the middle; stamens 3, included; stigmas branched; grain spindle-shaped, tapering to each end, minutely roughened, reddish-brown, nearly opaque, ¾ line long.

PLATE XX; *a*, spikelet enlarged about 5 times; *b*, *b*¹, empty glumes showing variations; *c* *c*¹, floral glumes showing variations in length of awns; *d*, palea.

Southern California. This species is doubtless worthy of attention as a forage plant.



MUHLENBERGIA GLAUCA (L.) R. & S.



MUHLENBERGIA DEBILIS Trin. Agrost. ii. 49.

Plant spreading, bushy-branched, perennial, usually purple-tinged or dark purple throughout.

Culms weak, ascending, geniculate and profusely branching below, somewhat thickened at the base and lower nodes, striate, often angular, smooth, 10 to 15 inches high.

Leaves of lower nodes usually reduced to scarious sheaths, often several in knotted fascicles at the nodes of much branched specimens. Leaves of culm 4 to 6; sheaths slightly scabrid, mostly shorter than the internodes; blades flat, hispid on both sides, 1 to 2 inches long; ligule membranaceous, lacerate, 1 line long.

Inflorescence an erect panicle 2 to 5 inches long, often included at base; branches single or in pairs and unequal, angular, spreading, slightly exceeding their intervals, the lower an inch long, spikelet-bearing to the base.

Spikelets pedicellate, 1-flowered, spindle-shaped, $1\frac{1}{2}$ lines long; empty glumes persistent, broadly elliptical, obtuse, thin-membranaceous, smooth, 1-nerved, nearly equal, $\frac{1}{2}$ line long or less; floret narrowly spindle-shaped, early deciduous, $1\frac{1}{2}$ lines long; floral glume lanceolate, bidentate at apex, puberulent, finely pubescent on the nerves below, thin, 3-nerved, lateral nerves marginal above, midnerve excurrent in a slender, minutely scabrid awn 4 to 7 lines long; palet lanceolate, nearly acute, cleft, minutely pubescent on the two nerves, 1 to $1\frac{1}{2}$ lines long; stamens 3, included; stigmas 2, repeatedly branched; grain narrowly conical, translucent, reddish-amber-color, 1 line long.

PLATE XXI; *a*, spikelet enlarged 25 times; *b*, empty glumes; *c*, palet.

Southern California to western Texas.



B. Meun. No. 8080

MUHLENBERGIA DEBILIS Trin.

T. Holm, del.

MUHLENBERGIA DUMOSA Scribn. in Vasey, Contr. Nat. Herb. iii. 71.

Plant perennial, coarse, from strong rootstock $\frac{1}{2}$ inch in diameter.

Culm erect, robust, giving off fine, solid, woody branches at each node, smooth, shining, 3 to 6 feet high.

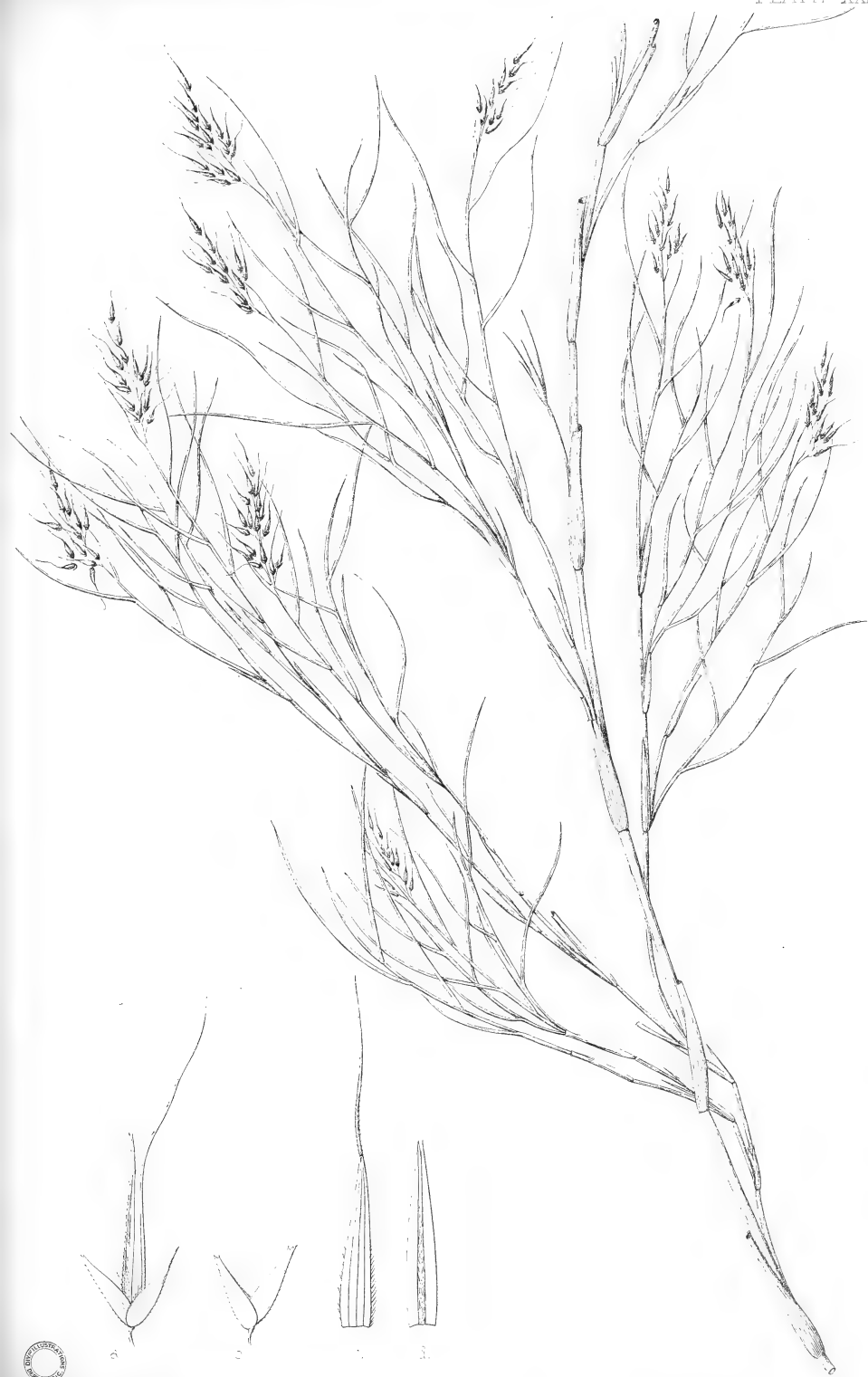
Leaves of culm 10 to 20, mostly reduced to open, yellow, scarious, smooth sheaths, the convolute blades falling early; leaves of the branches numerous, with slender involute blades 1 to 2 inches long, prominently articulated with the close sheath; ligule a minute, membranaceous collar.

Inflorescence numerous loose panicles 1 inch long or less, terminating the ramifications of the leafy, lateral branches.

Spikelets nearly sessile or on pedicels less than 1 line long; empty glumes persistent, divergent, ovate, acute, obtuse or bidentate at apex, carinate, membranaceous, except the minutely hispid, green, excurrent midnerve, subequal, $\frac{2}{3}$ line long; floret caducous, linear, the glume and palet slightly divergent at the apex, equal, $1\frac{1}{2}$ lines long; floral glume narrowly ovate, acute, convex, curved backward at the apex, membranaceous, ciliate below the middle, prominently 3-nerved, midnerve excurrent in a minutely hispid awn 1 to 2 lines long; palet lanceolate, nearly acute, finely pubescent between the two nerves; grain narrowly cylindrical, reddish-brown, scarcely translucent, roughened, $\frac{2}{3}$ line long.

PLATE XXII; *a*, spikelet enlarged 5 times; *b*, empty glumes showing the variation in the apexes; *c*, floral glume; *d*, palet.

Mexico, Arizona and southern California. A strongly rooted, spreading grass.



MUHLENBERGIA DUMOSA *Scribn.*

Thom del



MUHLENBERGIA PARISHII Vasey, Bull. Torr. Club, xiii. 53.

Plant perennial, loosely tufted.

Culms weak, ascending, geniculate, and often rooting below, diffusely branching, lower internodes smooth and shining, hispid below the panicle, 2 to 3 feet high.

Leaves of culm 6 to 12; sheaths hispid, usually exceeding the internodes; blades flat, hispid on both sides, 5- to 7-nerved, 2 to 3 lines wide and 3 to 5 inches long; ligule membranaceous, obtuse, ciliate, 1 line long or less.

Inflorescence an erect, linear panicle, 4 to 6 inches long, interrupted below; branches slightly exceeding the intervals, $1\frac{1}{2}$ inches long or less, crowded to the base with nearly sessile spikelets on the short subdivisions.

Spikelets narrow, 1-flowered, $1\frac{1}{2}$ to 2 lines long; empty glumes lance-ovate, acute or bidentate, carinate, membranaceous, hispidulous, colorless except the green, hispid midnerve which is excurrent in a hispid mucro or awn $\frac{1}{4}$ to $\frac{1}{2}$ as long as the glume, subequal, exceeding the floret, $1\frac{1}{2}$ to 2 lines long; floret spindle-shaped, not caducous, $1\frac{1}{2}$ lines long; floral glume lance-ovate, acute, membranaceous, firm, sparingly villous at base, 3-nerved, the lateral nerves uniting at the apex with the midnerve excurrent in a hispid awn 1 to 2 lines long; palea equaling the glume, lanceolate, nearly acute or slightly cleft at the apex, villous like the glume at the base; stamens 3; branching stigmas bright purple; grain spindle-shaped¹, tapering abruptly to each end, dark reddish-brown, opaque, $\frac{3}{4}$ line long.

PLATE XXIII; *a*, spikelet enlarged 5 times; *b*, empty glumes; *c*, floral glume; *d*, palea.

Southern California. This species is distinguished from *M. sylvatica* chiefly by the shorter awns and the more densely spicate inflorescence, and from *M. Californica*, which it approaches more closely by the looser panicle, the more decided awns of the empty glumes and the longer awns of the floral glumes.



ALOPECURUS ALPINUS Smith, Fl. Brit. iii. 1386; Engl. Bot. xvi. t. 1126.

Plant perennial, with a running rootstock, sometimes in bunches, but usually single culms in a place.

Culms erect, simple, robust, smooth, 6 to 20 inches high.

Leaves of culm 3 to 5; sheaths vaginate, open at the throat, striate, smooth, nearly equaling or exceeding the internodes; blades flat, hispid above, nearly smooth below, 2 to 3 lines wide, 2 to 6 inches long, the upper one shorter than its sheath; ligule membranaceous, obtuse, $\frac{1}{2}$ to 1 line long.

Inflorescence a dense, ovoid or oblong, spike-like panicle $\frac{1}{2}$ to 1 inch long and $\frac{1}{3}$ as thick.

Spikelets 1-flowered, elliptical, compressed, $1\frac{3}{4}$ to 2 lines long; empty glumes distinct nearly to the base, oblong, acute or abruptly acuminate, carinate, villose, 3-nerved, equal, $1\frac{3}{4}$ to 2 lines long; floral glume nearly rotund, the margins united $\frac{1}{4}$ the length from the base, ciliate at the obtuse apex, pubescent on the back above, membranaceous, 4- or 5-nerved, $1\frac{1}{2}$ lines long; awn dorsal, arising near the middle of the glume, slightly curved, exserted half its length; palea lanceolate, acute, slightly pubescent at the apex, 1-nerved; stigmas 2, slender, plumose; grain pear-shaped, compressed, yellow, nearly 1 line long.

PLATE XXIV; 1, plant with mature spikelets; *a*¹, spikelet enlarged about 18 times; *b*¹, floral glume.

Alaska from Point Barrow southward along the coast to Sitka and in the high mountain regions extending to Colorado; growing mostly in gravelly soil; very variable.

ALOPECURUS STEJNEGERI Vasey, Proc. U. S. Nat. Mus. x. 153.

Plant perennial.

Culms rather thick but weak, geniculate and decumbent below, smooth, 6 to 12 inches high.

Leaves of culm 3 or 4; sheaths loose, upper one inflated, smooth, exceeding the internodes; blades lanceolate, flat, nearly smooth on both sides, 2 to 4 inches long; ligule prominent, membranaceous, truncate, 2 lines long.

Inflorescence a dense, woolly, spicate, ovoid panicle 1 inch long and $\frac{1}{2}$ as thick.

Spikelets 1-flowered, compressed, $2\frac{1}{2}$ to 3 lines long, 1 line wide; empty glumes connate near the base, lance-ovate, acute, very villous, thin, 3-nerved, equal, $2\frac{1}{2}$ to 3 lines long; floral glume broadly ovate, barely acute, hyaline, sparsely pubescent or villose near the apex, especially on the keel, 5-nerved, 2 lines long; awn arising near the base of the glume, slender, exserted half its length, slightly dilated at the middle; palea small or wanting; stigmas 2, exserted, plumose.

PLATE XXIV; 2, plant natural size; *a*², spikelet enlarged about 12 times; *b*², floral glume side view.

Collected by Dr. Stejneger on the Commander Islands, in Bering Sea. It probably extends to the Aleutian Islands, but has not yet been reported from United States territory.

ALOPECURUS CALIFORNICUS Vasey, Bull. Torr. Club, xv. 13.

Plant perennial, tufted.

Culms geniculate below, often branched, slender, terete, smooth, 10 to 15 inches high.

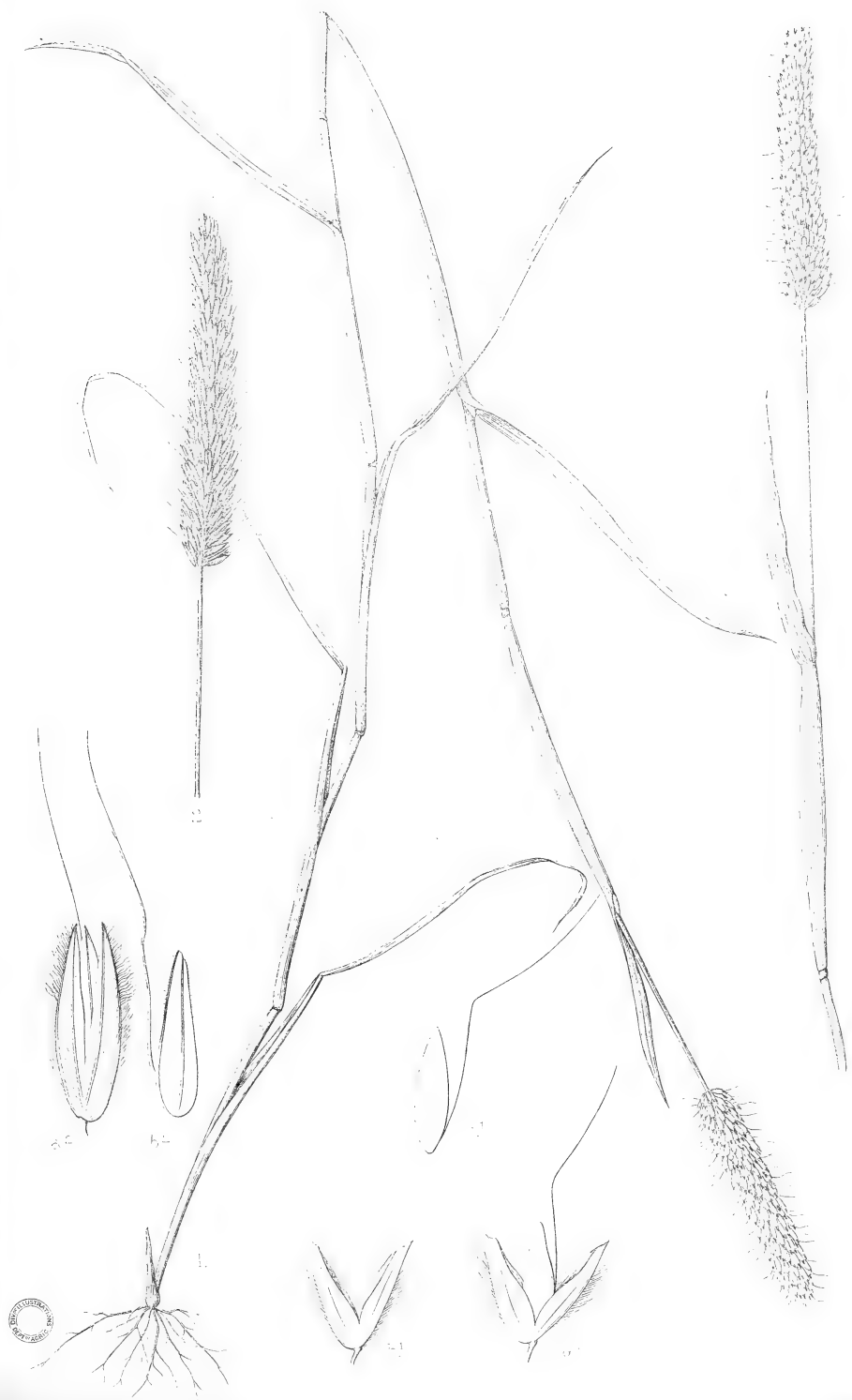
Leaves of culm 4 or 5; sheaths rather loose, upper one inflated, smooth, shorter than the internodes; blades flat, hispid above, 1 to 3 inches long; ligule membranaceous, acute, 2 lines long.

Inflorescence a dense cylindrical spike 1 to 2 inches long, $\frac{1}{4}$ to $\frac{3}{8}$ inches thick.

Spikelets 1-flowered, compressed, elliptical, $1\frac{1}{4}$ to $1\frac{3}{4}$ lines long; empty glumes oblong, obtuse, carinate, slightly united at base, thin, purple above, hairy on the keel and slightly pubescent on the obscure lateral nerves, $1\frac{1}{4}$ to $1\frac{3}{4}$ lines long; floral glume oblong-ovate, obtuse, edges united $\frac{1}{4}$ from the base, slightly chartaceous, smooth, obscurely 4-nerved, about equaling the empty glumes; awn arising near the base of the glume, twisted, bent at the middle, $2\frac{1}{2}$ to 3 lines long; palea wanting; grain flattened, broadly lanceolate, oblique, light green, $\frac{2}{3}$ line long.

PLATE XXV; 1, a^1 , spikelet with empty glumes spread; b^1 , empty glumes; c^1 , floral glume closed; 2, a^2 and b^2 , panicle, spikelet, and floral glume of *A. pratensis* drawn for comparison.

Southern California. This species differs from *A. pratensis* chiefly in its smaller size, the smaller spikelets, and obtuse empty glumes, which are united less than in that species.



No. 26.

ALOPECURUS GENICULATUS L. Var. ROBUSTUS Vasey, Bull.
Torr. Club, xv. 13.

Plant perennial, loosely tufted.

Culms geniculate below, sometimes branched, thick, smooth, black at the nodes, 20 to 30 inches high.

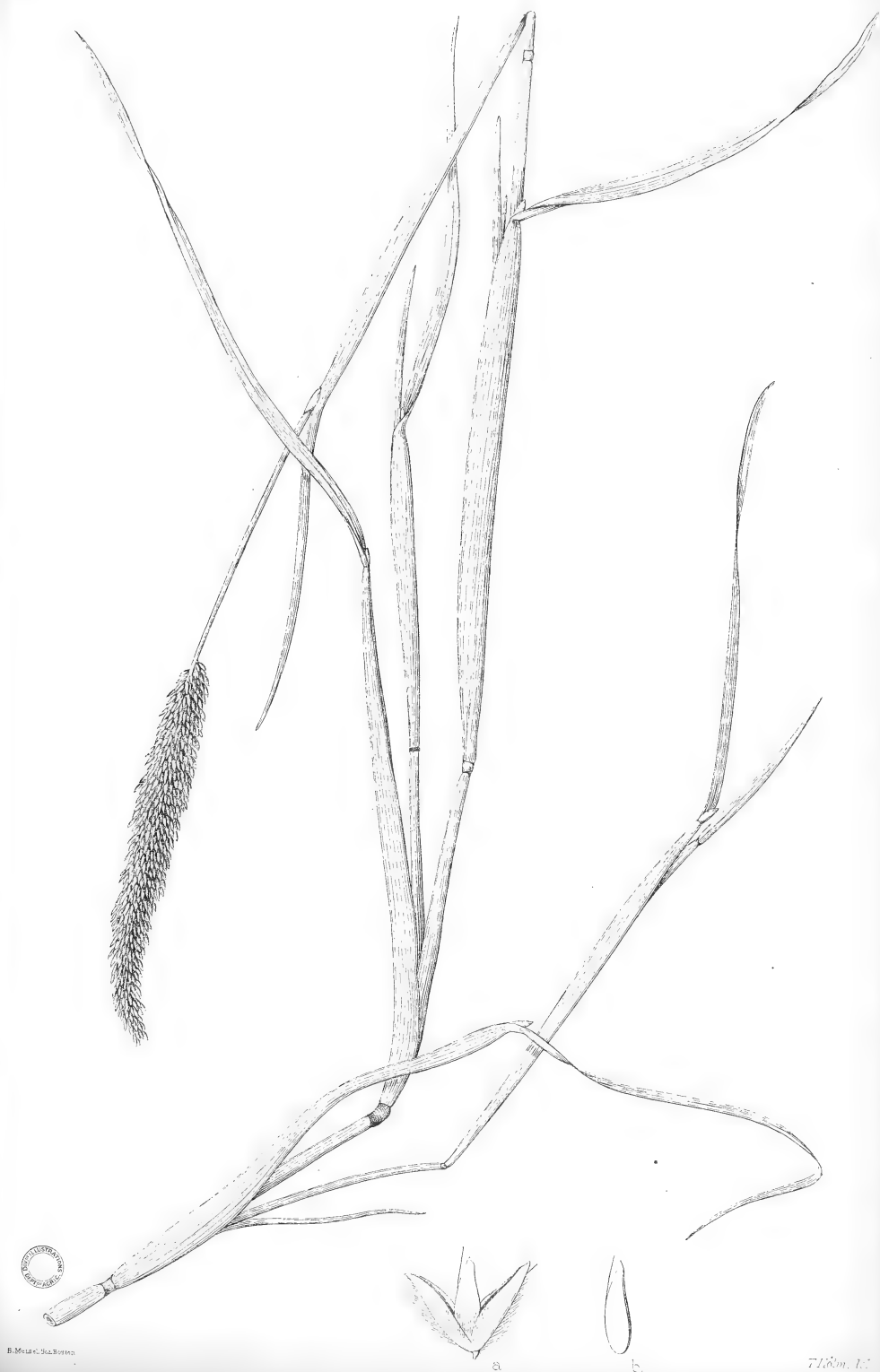
Leaves of culm 4 or 5; sheaths loose, open, smooth, striate, lower exceeding and upper nearly equaling the internodes; blades flat, hispid above, 2 to 3 lines wide, 3 to 6 inches long; ligule membranaceous, nearly acute, $2\frac{1}{2}$ lines long.

Inflorescence a dense, cylindrical, spicate panicle 2 to 3 inches long and $\frac{1}{4}$ inch thick, exerted at maturity.

Spikelets compressed, elliptical, 1-flowered, 1 line long; empty glumes slightly united at base, ovate, obtuse, short-hairy on the keel and obscure lateral nerves which are nearly marginal, 1 line long; floral glume ovate-oblong, obtuse, thin, smooth, 5-nerved, equaling the empty glumes; awn arising near the middle of the glume, straight, scarcely exerted; palea wanting; grain broadly lanceolate, oblique, dark brown, $\frac{3}{8}$ line long.

PLATE XXVI; *a*, spikelet with empty glumes opened; *b*, floret.

Washington to Alaska, and in the mountains of British America.



ALOPECURUS GENICULATUS L. VAR. *ROBUSTUS* Vasey.

No. 27.

ALOPECURUS HOWELLII Vasey, Bull. Torr. Club, xv. 12.

Plant low, tufted, annual, often purplish throughout.

Culms erect or somewhat geniculate, mostly simple, smooth, 3 to 6 inches high.

Leaves of culm usually 3; sheaths rather loose or vaginate, upper one more inflated, smooth, striate, the lower shorter than internodes, with narrow or filiform-convolute blades, hispid below, exceeding the culm, upper sheath exceeding the internode with a shorter blade; ligule membranaceous, obtuse, 1 line long.

Inflorescence a cylindrical, spicate panicle 1 inch long or less, usually included at base.

Spikelets compressed, elliptical, 1-flowered, $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long; empty glumes slightly united at base, oblong, obtuse, carinate, scarious on the margins, ciliate on the keel and silky-pubescent on the lateral nerves and near the base, $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long; floral glume broadly ovate-oblong, truncate, thin, smooth, 4-nerved, equaling the empty glumes; awn arising below the middle of the glume, slender and naked below, bent, 3 lines long; palea wanting.

PLATE XXVII; 1, plant natural size; a^1 , spikelet, side view; b^1 , floret, side view.

In wet soil, Oregon.

No. 27.

ALOPECURUS MACOUNII Vasey, Bull. Torr. Club, xv. 12.

Plant low, annual, tufted, 2 or 3 culms in a stool.

Culms erect or slightly geniculate below, slender, smooth, 3 to 6 inches high.

Leaves of culm usually 2; sheaths slightly inflated, striate, smooth, 1 to $1\frac{1}{2}$ inches long; blades flat or folded, narrow, acuminate, 1 inch long or less; ligule membranaceous, 1 line long.

Inflorescence an oblong, spicate panicle 1 inch or less long and $\frac{1}{4}$ inch thick, long peduncled.

Spikelets compressed, lance-oblong, 1-flowered, $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long; empty glumes slightly united at the base, oblong, obtuse, carinate, scarious at the apex, ciliate on the keel, and pubescent on the lateral nerves, $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long; floral glume broadly oblong, truncate, margins united to the middle, smooth, 4-nerved, nearly equaling the empty glumes; awn arising near the base of the glume, straight, $2\frac{1}{2}$ lines long; palea wanting; grain broadly lanceolate, oblique, dark brown, $\frac{1}{2}$ line long.

PLATE XXVII; 2, plant natural size; a^2 , spikelet, side view; b^2 , floret, side view.

On dry rocks, Vancouver Island.



B. Menard, lith. Boston.

1. *ALOPECURUS HOWELLII* Vasey.

F. Muller del.
2. *ALOPECURUS MACOUNII* Vasey

ALOPECURUS SACCATUS Vasey, Bot. Gaz. vi. 290.

Plant tufted, apparently annual.

Culm erect or slightly geniculate below, simple, smooth, nodes brown, 5 to 10 inches high.

Leaves of culm usually 3; sheaths rather loose, the upper one inflated, slightly roughened, usually shorter than the internodes; blades narrow, rough on both sides, 1 to 2 inches long; ligule membranaceous, $1\frac{1}{2}$ lines long.

Inflorescence a comparatively loosely-flowered, spicate panicle 1 to $1\frac{1}{2}$ inches long, often included.

Spikelets compressed, elliptical, 1-flowered, 2 lines long; empty glumes united at the base, ovate-oblong, barely acute, carinate, scarious at the apex, puberulent throughout, ciliate on the keel and lateral nerves, 2 lines long; floral glume broadly oblong, truncate, margins united to the middle or above, smooth except the ciliate apex, 4-nerved, 2 lines long; awn arising near the base of the glume, twisted, bent, 3 to 4 lines long; palea wanting; grain flattened, broadly lanceolate, oblique, brown, 1 line long.

PLATE XXVIII; *a*, spikelet enlarged about 6 times; *b*, empty glumes; *c*, floral glume, side view; *d*, grain.

Eastern Oregon.



AGROSTIS *ÆQUIVALVIS* Trin. Agrost. i. 116.

Plant probably perennial, tufted, with slender, knotted rootstocks, pale green with usually purple inflorescence.

Culms erect, slender, smooth, simple, 10 to 20 inches high.

Leaves of culm usually 3; sheaths close, smooth, lower exceeding the internodes; second shorter, upper much longer than the lower but at length exceeded by the growing culm; blades flat, nearly smooth, thin, erect, $1\frac{1}{2}$ lines wide, lower 3 to 6 inches, upper 2 to 3 inches long; ligule membranaceous, obtuse, 1 line long.

Inflorescence a rather narrow, loose panicle 3 to 5 inches long, usually included at the base until maturity; common rachis slender, smooth; branches 2 to 5, semiverticillate at the rather distant nodes, slender, minutely roughened, at length spreading, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long, spikelet-bearing beyond the middle.

Spikelets on pedicels usually equaling or exceeding themselves, lanceolate, turgid, 1-flowered, 1 line long; empty glumes nearly equal, or second longer, lanceolate, acute, convex, smooth, 1-nerved, 1 line long; floral glume broadly oblong, obtuse, thin, smooth, 5-nerved, $\frac{2}{3}$ line long; palet oblong, thin, smooth, 2-nerved, nearly equaling the glume, callous, minute, obscurely pilose; sterile pedicel usually minute, hairy above, $\frac{1}{4}$ as long (" $\frac{2}{3}$ as long," Trinius) as the floral glume; grain oblong, greenish-yellow, opaque, $\frac{1}{2}$ line long, free.

PLATE XXIX; *a*, spikelet enlarged 10 times; *b*, empty glumes; *c*, floral glume, dorsal view; *d*, palet.

California to Alaska, in damp mossy places. One specimen from Sitka, Alaska, Trinius' type locality, differs from those described in the parts of the spikelet being $\frac{1}{3}$ larger and the sterile pedicel half as long as the glume.



AGROSTIS DENSIFLORA Vasey, Contr Nat. Herb. iii. 702.

Plant annual, tufted, with fibrous roots.

Culm erect or geniculate at the lower nodes, rather stout, smooth, naked above, 6 to 12 inches high.

Leaves from the base few and short. Leaves of culm 2 or 3; sheaths rather loose, striate, nearly smooth, crowded below, longer than the internodes; blades flat or folded, hispidulous on both sides, striate, rather thick and rigid, erect, tapering to the apex, 2 to 3 lines wide below, 2 to 4 inches long; ligule membranaceous, prominent, obtuse, decurrent, 2 lines long.

Inflorescence a rather dense or slightly interrupted, spicate panicle 2 to 3 inches long and $\frac{1}{3}$ to $\frac{1}{2}$ inch thick; rays glomerate, branching, scabrous, bearing crowded spikelets on short, scabrous pedicels.

Spikelets 1-flowered, turgid, $1\frac{1}{4}$ lines long; empty glumes nearly equal (second slightly shorter), lanceolate, acuminate, carinate, membranaceous, rigid, hispidulous throughout; lower glume hispid on the keel, 1-nerved, $1\frac{1}{4}$ lines long; floral glume oblong, truncate, minutely toothed, thin-membranaceous, smooth except a minute tuft of white hairs on the ventral side at base, 5-nerved, nearly 1 line long, with or without a slender dorsal awn near the apex 1 line or less long; palea wanting; grain spindle-shaped, acute at each end, yellow, opaque, $\frac{2}{3}$ line long, falling free.

PLATE XXX; 1 and 2, typical specimens, full size; 3, a depauperate form; *a*, spikelet enlarged 10 times; *b*, empty glumes; *c*, floral glume side view; *d*, same back view; *e*, unawned floral glume.

Santa Cruz, California.



ERIOPOGON DENSIFLORUS (L.)

No. 31.

AGROSTIS EXARATA Trin. forma ASPERFOLIA Vasey.

Plant annual, not tufted, pale green throughout or purplish in the inflorescence.

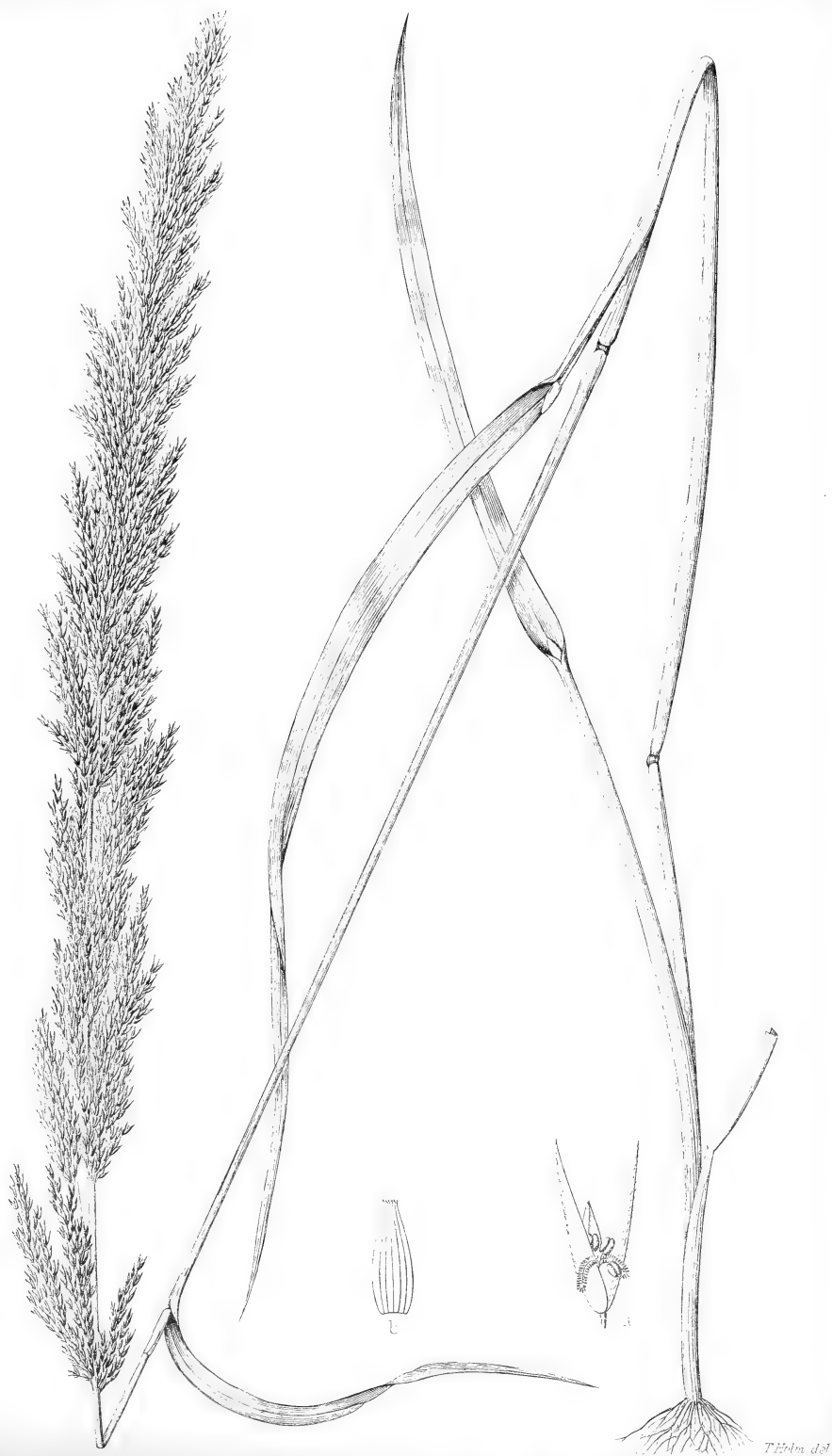
Culm erect or slightly geniculate below, rather robust, nearly smooth, at length naked above, 2 to 3 feet high.

Leaves of culm 3 or 4; sheaths rather loose, striate, smooth, the lower exceeding the internodes, the upper usually shorter; blades flat, scabrous on both sides, slender-pointed, 2 to 3 lines wide, 3 to 6 inches long; ligule almost herbaceous, striate, obtuse, decurrent, 3 to 4 lines long.

Inflorescence a rather dense, narrow, erect, or slightly nodding panicle 6 to 10 inches long, about 1 inch thick; common axis smooth and shining; branches glomerate, erect, scabrous, unequal, $\frac{1}{2}$ to 2 inches long; the shorter branch bearing spikelets to the base, the longer naked below.

Spikelets on hispid pedicels nearly equaling themselves, narrowly lanceolate, turgid, 1-flowered, 1 to $1\frac{1}{2}$ lines long; first empty glume lance-ovate, acute, slender-pointed, carinate above, hispidulous throughout, hispid on the keel, 1 to $1\frac{1}{2}$ lines long; second empty glume same as first, but smoother and $\frac{1}{4}$ to $\frac{1}{2}$ line shorter; floral glume broadly oblong, minutely dentate at the truncate apex, thin-membranaceous, 5-nerved to the apex, $\frac{2}{3}$ line long, with a slight, short, pilose callus at the base; palea minute or wanting; grain spindle-shaped, yellow, opaque, $\frac{1}{2}$ line long.

PLATE XXXI; *a*, spikelet enlarged about 12 times; *b*, floral glume, dorsal view.
California to Washington.



AGROSTIS EXARATA Tuck. FOPHIA ASPERFOLIA Tuck.

Titolu del

AGROSTIS EXARATA Trin. forma ASPERFOLIA Vasey.

Plant annual, not tufted, pale green throughout or purplish in the inflorescence.

Culm erect or slightly geniculate below, rather robust, nearly smooth, at length naked above, 2 to 3 feet high.

Leaves of culm 3 or 4; sheaths rather loose, striate, smooth, the lower exceeding the internodes, the upper usually shorter; blades flat, scabrous on both sides, slender-pointed, 2 to 3 lines wide, 3 to 6 inches long; ligule almost herbaceous, striate, obtuse, decurrent, 3 to 4 lines long.

Inflorescence a rather dense, narrow, erect, or slightly nodding panicle 6 to 10 inches long, about 1 inch thick; common axis smooth and shining; branches glomerate, erect, scabrous, unequal, $\frac{1}{2}$ to 2 inches long; the shorter branch bearing spikelets to the base, the longer naked below.

Spikelets on hispid pedicels nearly equaling themselves, narrowly lanceolate, turgid, 1-flowered, 1 to $1\frac{1}{2}$ lines long; first empty glume lance-ovate, acute, slender-pointed, carinate above, hispidulous throughout, hispid on the keel, 1 to $1\frac{1}{2}$ lines long; second empty glume same as first, but smoother and $\frac{1}{4}$ to $\frac{1}{2}$ line shorter; floral glume broadly oblong, minutely dentate at the truncate apex, thin-membranaceous, 5-nerved to the apex, $\frac{3}{8}$ line long, with a slight, short, pilose callus at the base; palea minute or wanting; grain spindle-shaped, yellow, opaque, $\frac{1}{2}$ line long.

PLATE XXXI; *a*, spikelet enlarged about 12 times; *b*, floral glume, dorsal view.

California to Washington.



AGROSTIS EXARATA Trin. FORMA ASPERIFOLIA Vasey.



AGROSTIS HALLII Vasey, Contr. Nat. Herb. iii. 74.

Plant perennial, from thick tufts of roots.

Culms erect, simple, smooth, stout, at length naked above, 2 to 3 feet high.

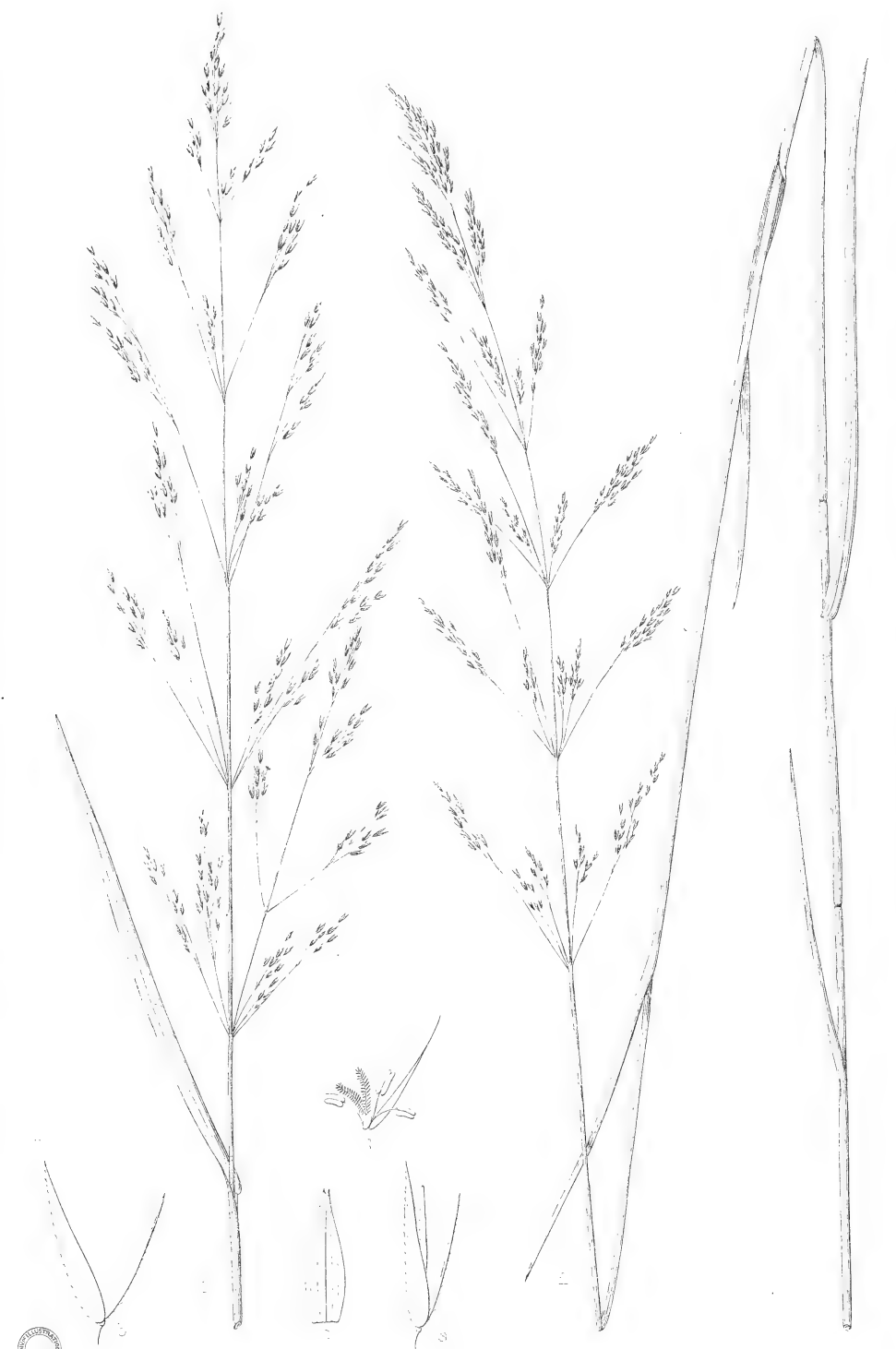
Leaves from the base numerous, mostly involute. Leaves of the culm 3 to 5; sheaths slightly roughened, close, usually crowded below, middle and upper ones shorter than internodes; blades flat, hispid on both sides, erect, 1 to 2 lines wide, 3 to 6 inches long; ligule membranaceous, acute, decurrent, 2 lines long.

Inflorescence a rather closely-flowered, narrow, erect panicle 6 to 9 inches long; common axis slender, straight, smooth, and shining or hispidulous toward the extremity; rays in clusters of 5 to many, semiverticillate at the 6 to 9 rather distant nodes, slender, scabrous, erect or slightly spreading, unequal, the longest 1 to 4 inches long, bearing beyond the middle rather crowded, pedicellate spikelets.

Spikelets lanceolate, turgid, 1-flowered, 1 to $1\frac{1}{4}$ lines long; empty glumes persistent, lanceolate, acute, convex, usually purple, hispid on the keel, 1-nerved, subequal (second slightly shorter), 1 to $1\frac{1}{4}$ lines long; floral glume oblong, obtuse, thin, smooth, except 2 tufts of short hairs at the base, 5-nerved, $\frac{2}{3}$ line long; palea wanting; grain oblong, tapering toward the apex, yellow, opaque, falling with the floral glume.

PLATE XXXII; *a*, spikelet enlarged about 12 times; *b*, empty glumes; *c*, floral glume, dorsal view; *d*, floral glumes, stamens and pistil.

California, Oregon, and Washington. Probably a valuable meadow grass.



E. Mearns, Del. Boston.

AGROSTIS HALLII Vasey.

T. Holm del.

No. 33.

AGROSTIS HUMILIS Vasey, Bull. Torr. Club, x. 21.

Plant perennial, in small dense tufts, from a short rootstock or tufts of fine roots.

Culms erect, slender, smooth, naked above, 4 to 8 inches high.

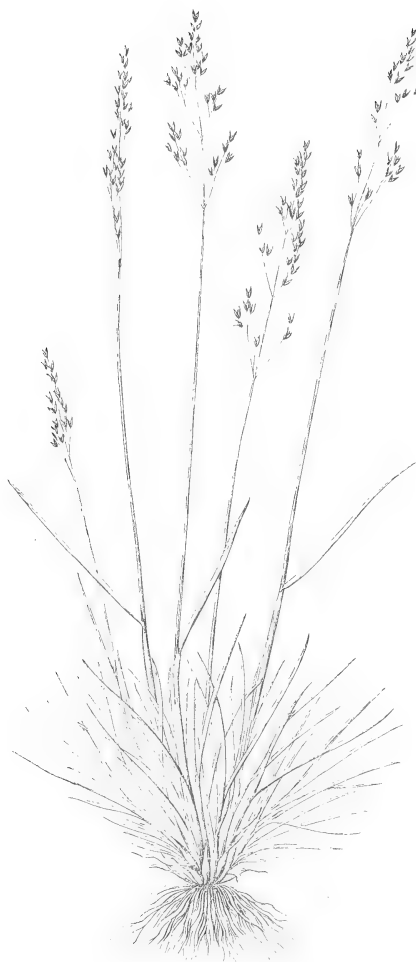
Leaves from the base numerous, narrow, smooth, mostly erect, not rigid, 1 to 3 inches long. Leaves of culm usually but one; sheath close, smooth, about $\frac{1}{4}$ as long as the culm; blade flat, erect, $\frac{2}{3}$ line wide, $\frac{1}{2}$ to 2 inches long; ligule auriculate or 3-lobed, $\frac{1}{2}$ line long.

Inflorescence a narrow, rather few-flowered, erect panicle, 1 to $1\frac{1}{2}$ inches long; rays mostly in twos or threes below, twos or single above, erect or slightly spreading, spikelet-bearing beyond the middle.

Spikelets lanceolate, turgid, 1-flowered, nearly 1 line long; empty glumes equal, persistent, ovate-lanceolate, acute, convex, smooth, purple, 1-nerved, $\frac{4}{5}$ to 1 line long; floral glume ovate-oblong, minutely toothed at the obtuse apex, thin, smooth, purple, or rarely green, 5-nerved, $\frac{2}{3}$ line long; palet ovate-oblong, thin, smooth, 2-nerved, $\frac{1}{2}$ line long; grain spindle-shaped, equally acute at each end, $\frac{1}{2}$ line long.

PLATE XXXIII; 1, 2, and 3, plants natural size; *a*, spikelet enlarged 10 times; *b*, empty glumes; *c*, floral glume, dorsal view; *d*, palet rolled about the grain.

Oregon and Washington; wet soil.



AGROSTIS TENUIS Vasey, Bull. Torr. Club, x. 21.

Plant perennial, loosely tufted, with short rootstocks and abundant slender fibrous roots.

Culms erect or somewhat geniculate below, slender, smooth, naked above, 6 to 10 inches high.

Leaves from the base abundant, flat or involute, 1 to 3 inches long. Leaves of culm usually 2; sheaths close, smooth, shorter than the internodes, blades flat or involute, nearly smooth, $\frac{1}{2}$ line wide, 1 to 2 inches long; ligule obtuse, nearly 1 line long.

Inflorescence an open pyramidal panicle, 2 to 3 inches long, usually purple throughout; common axis scabrous toward the extremity, slightly flexuous; rays in threes or fives below, in twos or single above, slender, scabrous, flexuous, at length spreading, $1\frac{1}{2}$ inches long or less, divided and spikelet-bearing beyond the middle.

Spikelets on pedicels about equaling themselves, obovate, less than 1 line long; empty glumes rather unequal (second shorter and broader), ovate-lanceolate, acute, convex, smooth or first slightly scabrous on the keel above, less than 1 line long; floral glume oblong, obtuse, hyaline, smooth, obscurely 5-nerved, $\frac{1}{2}$ line long; palea wanting; grain oblong, thicker below, dull yellow, $\frac{1}{3}$ line long.

PLATE XXXIV; *a*, spikelet enlarged 15 times; *b*, empty glumes; *c*, floral glume, dorsal view; *d*, floral glume, side view.

Southern California and perhaps extending with varying forms to Washington.



ACROSTIS TENUIS Vasey

J. H. J.



CALAMAGROSTIS ALEUTICA Trin. Bong. Veget. Sitcha, 171.

Plant perennial, densely tufted, with stont rootstocks.

Culms erect, simple, smooth, 2 to 5 feet high.

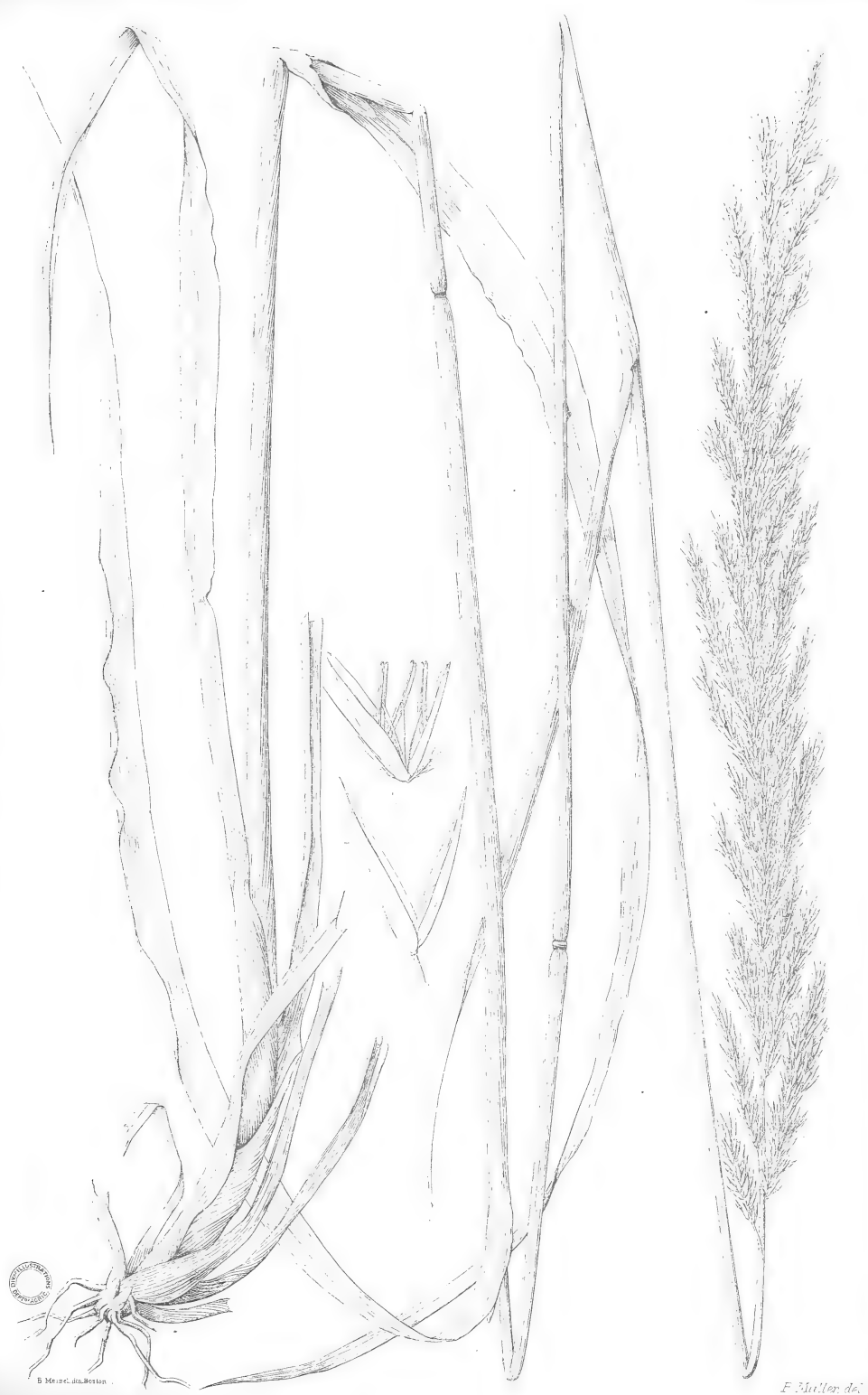
Leaves from the base, with broad tapering sheaths and rather rigid, erect blades a foot long or more. Leaves of culm usually 3; sheaths loose, striate, slightly roughened, usually shorter than the internodes; blades flat or loosely involute, with long, attenuate points hispid on both sides, 10 to 20 inches long; ligule ovate, truncate, nearly 2 lines long.

Inflorescence a rather narrow, closely flowered, erect panicle 6 to 10 inches long and 1 to 2 inches wide; rays unequal, crowded in 10 to 15 clusters, the longer rays 1 to 3 inches long, erect or ascending, subdivided, and spikelet-bearing beyond the middle, the shorter ones spikelet-bearing to the base.

Spikelets usually exceeding the pedicels, 2 to 3 lines long; empty glumes spreading at flowering-time, narrowly lanceolate, acute, slightly scabrid, hispid on the nerves; first glume carinate, 1-nerved, $2\frac{1}{2}$ to 3 lines long; second glume convex, 3-nerved, $\frac{1}{4}$ line shorter; floral glume oblong, obtusely 2-lobed at the apex, thin, purple or purple spotted, hispidulous, 3-nerved, or obscurely 4- or 5-nerved, 2 lines long; hairs of the callus and linear rudiment half as long as the glume; awn attached below the middle, not equaling the glume; palet oblong, irregularly toothed or fringed at the obtuse apex, thin 2-nerved, $1\frac{1}{2}$ lines long; lodicules present, but small.

PLATE XXXV; *a*, empty glumes; *b*, floral glume, palet, and inclosed stamens nearly in the natural positions as seen at flowering time.

California to Alaska. The northern specimens are usually larger and have larger spikelets. A tall, coarse grass, eaten by cattle during winter.



CALAMAGROSTIS ALEUTICA Trb.

CALAMAGROSTIS BOLANDERI Thurb. Bot. Cal. ii. 280.

Plant perennial, loosely tufted.

Culms erect or slightly geniculate at base, somewhat scabrous near the nodes and panicles, 2 to 4 feet high.

Leaves of culm 3 to 5; sheaths rather loose, striate, scabrous, usually shorter than the internodes; blades flat, scabrous on both sides, 6 to 10 inches long, 2 to 4 lines wide; ligule truncate, erose, or lacerate, 2 lines long.

Inflorescence a loose, pyramidal, erect or flexuous panicle 3 to 8 inches long; rays in threes or fives, slender, scabrous, subdivided, and spikelet-bearing beyond the middle.

Spikelets on pedicels equaling or exceeding themselves, turgid, 1-flowered, $1\frac{1}{2}$ to 2 lines long; empty glumes equal, lanceolate, acute, or the second somewhat obtuse, convex, nearly smooth, purple-tinged, turning brown in age, 1-nerved or the second obscurely 3-nerved, $1\frac{1}{2}$ to 2 lines long; floral glume oblong, 4-toothed at the obtuse apex, minutely scabrid, 4-nerved, $1\frac{1}{2}$ lines long; hairs of callus and filiform rudiment half as long as the glume; awn attached almost at the base, twisted, slightly bent, $2\frac{1}{2}$ to 3 lines long; palet oblong, bidentate at the apex, minutely scabrid, thin, 2-nerved, 1 line long; grain oblong, slightly flattened, yellow, opaque, 1 line long; lodicules present, but small.

PLATE XXXVI; *a*, empty glumes enlarged 8 times; *b*, rudiment and floret with glume and palet, spread as at flowering-time; *c*, floral glume, dorsal view.

Moist woods, Mendocino County, Cal.



CALAMAGROSTIS BOLANDERI (Zucc.)



CALAMAGROSTIS BREWERI Thurb. Bot. Cal. ii. 280.

Plant perennial, in small, dense tufts.

Culms erect, simple, slender, smooth, and wiry, about 1 foot high; nodes black.

Leaves from the base, abundant, with scarious sheaths and setaceous involute blades 3 inches long. Leaves of culm usually but one above the base; sheath close, striate, smooth, 1 to 2 inches long; blade erect, scabrid, involute, 1 inch long or less; ligule narrow, acute, 1 line long.

Inflorescence a loose-spreading panicle 2 to 3 inches long; rays solitary or in twos or threes, spreading or even deflexed, purple, the lower $\frac{1}{2}$ to 1 inch long, bearing 2 or 3 spikelets at the ends.

Spikelets on pedicels about equaling themselves, turgid, 1-flowered, $1\frac{1}{2}$ to 2 lines long; empty glumes nearly equal (second slightly longer), lanceolate, acute, convex, purple, scarious-margined, smooth, 1-nerved (or second obscurely 3-nerved), $1\frac{1}{2}$ to 2 lines long; floral glume oblong, 4-toothed at the obtuse apex, thin, minutely scabrid or nearly smooth, 4-nerved, $1\frac{1}{2}$ lines long; hairs of the callus short, of the rudiment $\frac{2}{3}$ as long as the glume; awn attached near the base, exerted a line or more; palet oblong, obtuse, or bidentate at the apex, thin, smooth, $1\frac{1}{4}$ lines long; grain oblong, flattened, yellow, opaque, $\frac{3}{4}$ line long; lodicules minute or absent.

PLATE XXXVII; *a*, empty glumes enlarged 8 times; *b*, rudiment and floret with glume and palet spread to show the stamens; *c*, floral glume, dorsal view.

In the Sierras of California, at an altitude of 9,000 to 10,000 feet.



CALAMAGROSTIS CRASSIGLUMIS Thurb. Bot. Cal. ii. 281.

Plant perennial, tufted, with rather strong rootstocks.

Culm erect, simple, smooth, rather stout, rigid, 10 to 15 inches high.

Leaves from the base and of sterile shoots numerous, 2 to 6 inches long. Leaves of culm 2 or 3; sheaths loose, striate, smooth, exceeding the internodes; blades divaricate, involute toward the acute points, thick, striate, hispid above, smooth beneath, 2 to 4 inches long; ligules obtuse, $\frac{1}{2}$ line long or less.

Inflorescence a rather dense, almost spicate, erect panicle, 2 inches long, deep purple; rays glomerate, unequal, less than $\frac{1}{2}$ inch long, crowded nearly or quite to the base with short-pediceled spikelets.

Spikelets turgid, acute, $1\frac{1}{2}$ to 2 lines long; empty glumes broadly lanceolate or lance-ovate, abruptly pointed, subcartilaginous, with thin margins, hispidulous throughout, hispid on the nerves, 2 lines long or less; first glume 1-nerved (rarely 2-nerved); second glume 3-nerved; floral glume oblong-ovate, toothed at the obtuse apex, rather thick, minutely hispid, 5-nerved, $1\frac{1}{2}$ lines long; hairs of the callus and of the short, linear rudiment $\frac{2}{3}$ as long as the glume; awn attached at the middle or below, equaling or slightly exceeding its glume; palea oblong, bidentate at the apex, 2-nerved, about 1 line long; lodicules 2, persistent, broadly lanceolate, thin, nearly $\frac{1}{2}$ line long.

PLATE XXXVIII; *a*, empty glumes enlarged 5 times; *b*, floral glume, dorsal view, partly unrolled; *c*, lodicules, stamens, pistil and ventral view of floral glume spread out.

Swamps northern California to Washington and Vancouver Island. The northern specimens are taller and larger.



CALAMAGROSTIS CRASSICAULIS Turcz.



CALAMAGROSTIS CUSICKII Vasey, Bot. Gaz. x. 224.

Plant perennial, loosely tufted, with numerous sterile shoots and few flower-bearing culms, from strong creeping rootstocks.

Culms erect, simple, smooth, 3 to 4 feet high.

Leaves of sterile shoots with close, overlapping sheaths and flat, slightly hispid, flexible blades 10 to 15 inches long. Leaves of culm 3 or 4; sheaths striate, nearly smooth, half as long as the internodes, or the lower ones equaling the shorter internodes; blades flat, hispid on both sides, 6 to 10 inches long, 2 to 3 lines wide; ligule obtuse, decurrent, 2 to 3 lines long.

Inflorescence a rather closely flowered, oblong, erect panicle 6 inches long, 1 inch thick; rays crowded in 10 to 12 semiverticillate clusters, ascending, unequal, the longer ($1\frac{1}{2}$ inches) subdivided and bearing clusters of short-pediceled spikelets beyond the middle, the shorter ray spikelet-bearing to the base.

Spikelets narrow, acute, 2 to $2\frac{1}{4}$ lines long; empty glumes lanceolate, acute or acuminate, convex, nearly smooth, rigid; first glume 1-nerved, 2 to $2\frac{1}{4}$ lines long; second glume obscurely 3-nerved and slightly shorter; floral glume oblong, 4-toothed at the slightly cleft apex, thin, smooth, 4-nerved above, $1\frac{1}{2}$ lines long; awn attached below the middle, slightly exceeding the glume; hairs of the callus and very small rudiment scanty, $\frac{1}{2}$ as long as the glume; palea oblong, obtuse, thin, 2-nerved, $1\frac{1}{2}$ lines long.

PLATE XXXIX; *a*, spikelet enlarged 6 times; *b*, empty glumes; *c*, floral glume, side view; *d*, palea, ventral view, partly unrolled.

Eastern Oregon, at an altitude of 5,000 to 6,000 feet. This grass produces a large quantity of foliage and probably will be found useful for cultivation.



P. N. S. 1890

CA. ANDROPOGON & C. CIVIL. 1890

CALAMAGROSTIS DENSA Vasey, Bot. Gaz. xvi. 147.

Plant perennial, from strong root stocks densely tufted or in large patches.

Culms erect, stout, nearly smooth or slightly hispid just below the black constricted nodes, 3 to 4 feet high.

Leaves of culm 4 to 5; sheaths rather loose, striate, hispid, the lower exceeding the internodes, the upper one including the base of the panicle, middle ones little shorter than the internodes; blades flat near the base, involute toward the long, attenuate points, hispid on both sides, or nearly smooth beneath, 1 foot long or less, 3 to 4 lines wide; ligule lacerate, 2 to 3 lines long.

Inflorescence a narrow, lance-oblong, densely flowered panicle, 4 to 6 inches long, $\frac{1}{2}$ inch thick; rays semiverticillate in a kind of collar on the slightly hispid rachis, appressed, 1 inch long or less, densely crowded to the base with nearly sessile spikelets.

Spikelets narrow, 1-flowered, $2\frac{1}{2}$ lines long; empty glumes, equal, lanceolate, acute; first glume carinate and 1-nerved; second glume concave, 3-nerved, minutely hispid on the nerves, $2\frac{1}{2}$ lines long; floral glume oblong; 4-toothed at the 2-lobed apex, smooth, 4-nerved, 2 lines long; hairs of the rudiment half as long as the glume, of the callus shorter; awn attached below the middle, equaling or slightly exceeding the glume; palet linear-oblong, bidentate at the apex, thin, 2-nerved, $1\frac{1}{2}$ lines long; grain narrowly oblong.

PLATE XL; *a*, empty glumes spread apart, enlarged 6 times; *b*, floret with glume and palet spread apart; *c*, floral glume, dorsal view.

Southern California.



CALAMAGROSTIS DENSEA Vasey.



CALAMAGROSTIS DESCHAMPSIOIDES Trin. Sp. Gram. iii. t. 354.

Plant perennial, tufted, stoloniferous.

Culms decumbent at base, smooth, 6 to 10 inches high.

Leaves from the base and of sterile shoots numerous, flat or slightly involute, scabrid above, 3 to 6 inches long. Leaves of culm usually 2; sheaths close, smooth, shorter than the internodes; blades folded or involute, erect, 1 to 2 inches long; ligule 1 line long.

Inflorescence a loose, ovate or pyramidal panicle, 1 to 3 inches long; rays in twos or threes, $1\frac{1}{2}$ inches long or less, divided and bearing 3 to 6 spikelets beyond the middle.

Spikelets on pedicels about equaling themselves, turgid, 1-flowered, 2 to $2\frac{1}{4}$ lines long; empty glumes lance-ovate, acute, convex, minutely hispid or nearly smooth, purple, becoming brown in age; first glume 1-nerved, $1\frac{3}{4}$ to $2\frac{1}{4}$ lines long; second glume obscurely 3-nerved and slightly longer; floral glumes lanceolate or lance-oblong, bidentate at the apex, minutely hispid, 4-nerved above, 2 lines long; hairs of the callus and rudiment half as long as the glume; awn attached to the middle or above, 2 lines long or less; palet oblong, obtuse, thin, 2-nerved, 2 lines long; grain oblong, flattened, yellow, opaque, 1 line long; lodicules very small.

PLATE XLI; *a*, empty glumes spread somewhat, enlarged 5 times; *b*, rudiment and floret with glume and palet spread; *c*, floral glume, dorsal view; *d*, stamens and pistil.

Alaska and adjacent islands.



CALAMAGROSTIS DESCHAMPSIODES T.

CALAMAGROSTIS HOWELLII Vasey, Bot. Gaz. vi. 271.

Plant perennial, densely tufted, with abundant, rather coarse roots.

Culms erect or somewhat geniculate below, simple, smooth, 10 to 20 inches high.

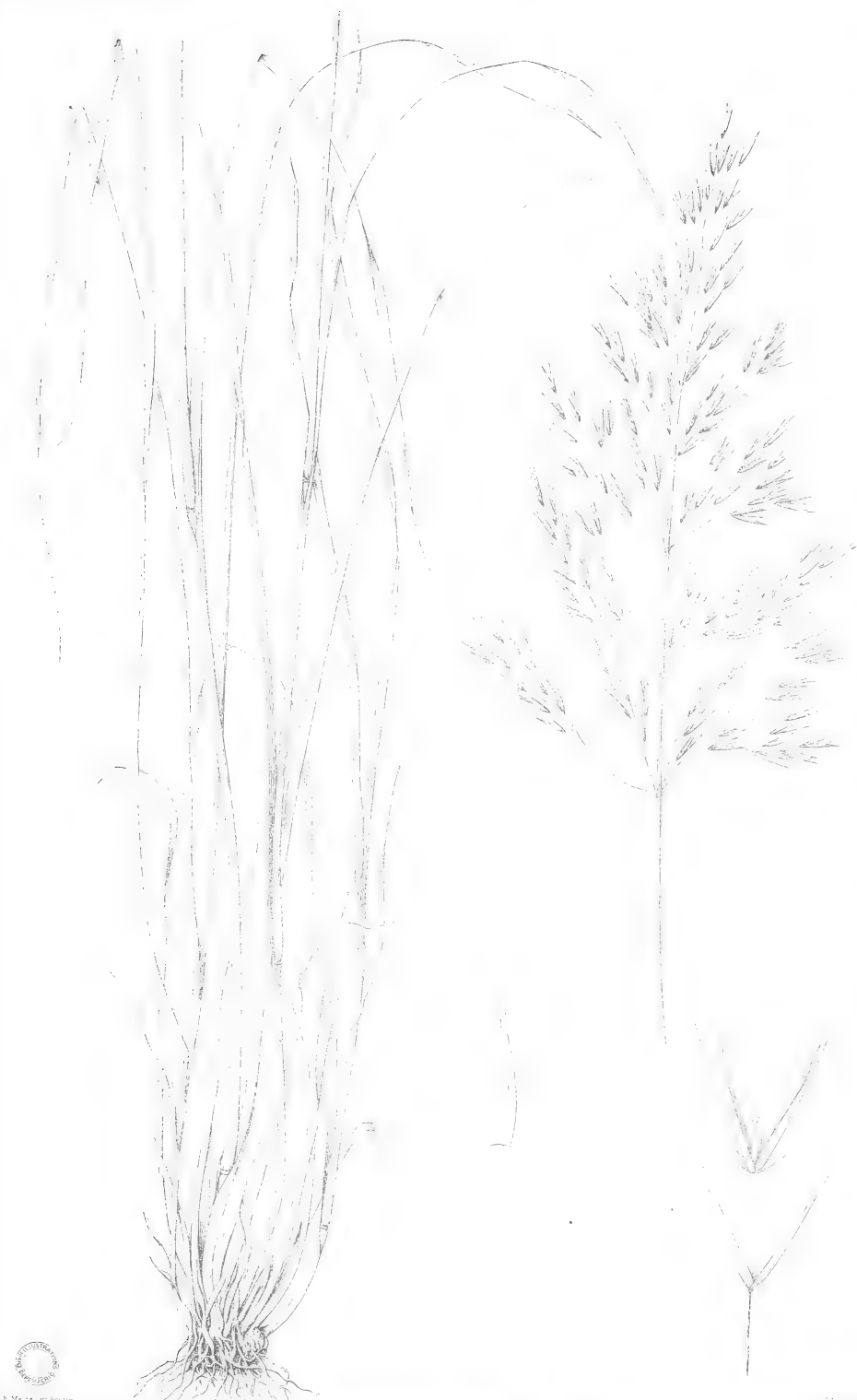
Leaves of sterile shoots numerous, with close, smooth sheaths and slender, involute blades nearly equaling or even exceeding the culms. Leaves of the culm 2 or 3; sheaths close, striate, smooth, equaling the internodes; blades ascending, flat or involute, attenuate-pointed, firm, not rigid, slightly hispid above, 5 to 8 inches long, 1 line wide; ligule scarious, often purple, nearly acute, $2\frac{1}{2}$ lines long.

Inflorescence an oblong or pyramidal panicle 2 to 5 inches long, spreading at flowering-time and more or less contracted afterward; rays mostly in fives, slender, scabrous, $1\frac{1}{2}$ inches long or less, subdivided, and bearing 5 to 10 spikelets beyond the middle.

Spikelets on pedicels nearly equaling or often exceeding themselves, turgid, acute, $2\frac{1}{2}$ to 3 lines long; empty glumes lanceolate, acuminate, convex, carinate above, smooth; first glume 1-nerved, $2\frac{1}{2}$ to 3 lines long; second glume distinctly 3-nerved, slightly shorter; floral glume lance-ovate, thin, nearly smooth, $2\frac{1}{2}$ to 3 lines long, cleft at the apex, each lobe terminating in two slender teeth formed by the excurrent nerves awn attached about $\frac{1}{3}$ from the base, bent, $\frac{1}{2}$ inch long; hairs of the callus half as long as the glume; hairs and awn of the rudiment equaling the glume; palet oblong, the two nerves excurrent at the obtuse apex, thin, smooth, 2 lines long; grain narrowly oblong, slightly flattened, 1 line long.

PLATE XLII; *a*, empty glumes; *b*, rudiment and floret with glume and palet spread apart, showing the grain; *c*, palet.

Oregon. A handsome species easily distinguished by the long setaceous leaves, the prominent awns, and the slender teeth of both glumes and palets. It produces abundant foliage, and should be tried in cultivation as a pasture or meadow grass.



CALAMAGROSTIS PURPURASCENS R. Br. in Richardson, Bot.
Appx. Franklin's Voy. 3.

Plant perennial, tufted, with rather coarse woolly roots.

Culms erect, simple, smooth and shining or slightly hispid near the nodes, 2 to 2½ feet high.

Leaves of culm usually 3; sheaths striate, hispidulous, or nearly smooth, much shorter than the internodes; blades flat, involute toward the attenuate points, flexible, hispidulous, 6 to 10 inches long; ligule lacerate or fimbriate, obtuse, 2 lines long.

Inflorescence a closely flowered, erect, narrow panicle, 3 to 4 inches long, ⅓ inch thick; rays crowded in 10 to 12 clusters, appressed, unequal, ¾ inch long or less, the longer spikelet-bearing beyond the middle, the shorter crowded with spikelets to the base.

Spikelets on pedicels half as long as themselves, turgid, acute, 2 lines long; empty glumes lanceolate, acute, smooth, purple at apex or throughout; first glume carinate, 1-nerved; second glume convex, distinctly 3-nerved, 2 lines long; floral glume oblong, erose at the obtuse apex, smooth, 4-nerved, 1½ lines long; awn attached ¼ way from the base, 2 lines long; hairs of the rudiment unequal, half as long as the glume, those of the callus scanty and shorter; palet oblong, obtuse, thin, 2-nerved, 1½ lines long.

PLATE XLIII; *a*, spikelet enlarged 7 times; *b*, empty glumes; *c*, floral glume, side view; *d*, palet, dorsal view.

Alaska and British America, extending south in the Cascade Mountains to Washington.



CALAMAGROSTIS PURPURASCENS R. & S.

CALAMAGROSTIS TWEEDYI Scribn. Contr. Nat. Herb. iii. 83.

Plant perennial, loosely tufted, stoloniferous.

Culms erect, smooth, robust, thick, 3 to 3½ feet high.

Leaves from the base, flat, lanceolate, slightly hispid, 5 to 10 inches long, 4 to 5 lines wide. Leaves of culm 2 or 3; sheaths rather loose, striate, smooth or slightly scabrous above, shorter than the internodes; blades flat, erect, hispid, 1 to 3 inches long; ligule thin, membranaceous, decurrent, 3 to 4 lines long.

Inflorescence a close, erect, oblong panicle 3 to 4 inches long, ½ inch thick; rays 5 to many, crowded in 12 to 15 clusters, appressed, unequal, an inch long or less, the longer spikelet-bearing above the middle, the shorter crowded to the base.

Spikelets short-pedicel, turgid, 1-flowered, 3 lines long; empty glumes lanceolate, acute, nearly smooth; first glume 1-nerved, slightly carinate; second glume 3-nerved, convex, 3 lines long; floral glume ovate-oblong, unequally toothed at the rounded apex, minutely scabrid, 4-nerved, 2½ lines long; awn attached ¼ way from the base of the glume, twisted and bent, 3 to 4 lines long; hairs of the callus short and unequal, those of the rudiment half as long as the glume; palet lance-oblong, obtuse, thin, smooth, 2-nerved, 2 lines long; grain oblong, yellow, opaque, 1¼ lines long.

PLATE XLIV; *a*, spikelet, enlarged 5 times; *b*, empty glumes, spread apart; *c*, floral glume, side view; *d*, palet, dorsal view; *e*, rudiment and palet; *f*, floret and rudiment.

Cascade Mountains, Washington.

DESCHAMPSIA CÆSPITOSA Beauv. var. ARCTICA Vasey.

Plant perennial, densely caespitose.

Culms erect, stout, smooth, 10 to 15 inches high.

Leaves of sterile shoots numerous, with rather loose, thin, overlapping sheaths and flat or folded, erect blades 4 to 6 inches long. Leaves of the culm usually but one above the base; sheath rather loose, striate, smooth, 4 to 5 inches long; blade flat or folded, slightly scabrid above, 1 to 3 inches long; ligule thin, attenuate-pointed, 2 to 4 inches long.

Inflorescence a loose, pyramidal or oblong panicle 4 to 5 inches long; rays mostly in threes or twos at the 6 or 7 nodes of the slightly flexuous, smooth, common axis, scabrous, 2 inches or less long, subdivided and spikelet-bearing beyond the middle.

Spikelets on pedicels about equaling themselves, slightly compressed, 2- to 3-flowered, 3 to $3\frac{1}{2}$ lines long; empty glumes lance-ovate, minutely bidentate at the apex, thin, scarious-margined, smooth, purple turning brownish; first glume 1-nerved, $2\frac{1}{2}$ lines long; second glume wider, slightly longer, 3-nerved; floral glume oblong, erose 4-toothed at the truncate apex, thin, obscurely 4-nerved, 2 to $2\frac{1}{2}$ lines long; awn attached near the base, straight, about 2 lines long; hairs of the callus $\frac{1}{4}$ as long as the glume; internodes of the rachilla hairy, 1 line long, extended beyond the base of the palea oblong, 2-lobed at the apex, thin, 2-nerved, 2 lines long; stamens 3 with short upper floret; filaments.

PLATE XLV; *a*, empty glumes; *b*, florets slightly opened.

Coast of Alaska and adjacent islands.



DESCHAMPSIA CAESPITOSA BEAUV. VAR. ARCTICA Vasey.

F. Miller, del.



No. 46.

TRisetum CALIFORNICUM Vasey, n. sp.

Plant apparently annual, loosely tufted, with numerous slender roots.

Culms geniculate below, spreading, weak, rather slender, branching, velvety-pubescent near the nodes, 10 to 20 inches high.

Leaves of culm usually 3; sheaths rather loose, striate, finely pubescent, retrorsely hispidulous, the lower shorter than the internodes, the upper longer and usually inclosing the base of the panicle; blades flat or folded, erect, finely pubescent, hispidulous, 2 to 3 inches long, 1 line wide; ligule obliquely obtuse, somewhat lacerate, 1 line long or less.

Inflorescence a narrow, contracted, loose, flexuous panicle, 3 to 4 inches long, somewhat interrupted below; rays erect, mostly in twos, unequal, $\frac{1}{2}$ to 2 inches long, spikelet-bearing to the base.

Spikelets on pedicels $\frac{1}{2}$ as long as themselves, obovate, 3-or 4-flowered, $2\frac{1}{2}$ to 3 lines long; empty glumes oblanceolate, barely acute or obtuse, scabro-pubescent, scarious-margined; first glume 3-nerved; second glume broader, 5-nerved, 2 lines long; floral glume ovate-lanceolate, cleft $\frac{1}{4}$ way down from the thin apex, smooth, obscurely 5-nerved, 2 to $2\frac{1}{2}$ lines long; awn attached below the cleft, bent, 3 to 4 lines long; internode of rachilla $\frac{1}{2}$ line long, slightly hairy; palea oblong, spread out above, 2-toothed, thin, 1 line long.

PLATE XLVI; figure of the plant taken from a rather young and depauperate specimen; *a*, spikelet enlarged 7 times; *b*, empty glumes; *c*, floral glumes, side view; *d*, palea, dorsal view.

Lower California near the boundary and probably extending into southern California.



TRISSETUM CANESCENS Buckley, Proc. Acad. Phil. 1862. 100.

Plant perennial, loosely tufted, somewhat thickened at base, with numerous fibrous roots.

Culms erect, striate, nearly smooth, 2 to 3 feet high.

Leaves from the base, with close, short sheaths and flat, canescent blades 6 to 10 inches long. Leaves of culm usually 3; sheaths rather loose, open above, striate, canescent or nearly smooth, shorter than the internodes; blades flat, canescent, scabrid or nearly smooth, 4 to 6 inches long, 3 lines wide; ligule ovate, erose or lacerate, 2 to 3 lines long.

Inflorescence a narrow, somewhat flexuose, rather closely flowered panicle 6 to 8 inches long; rays mostly in fours or threes at the 10 to 12 nodes of the scabrid or nearly smooth common axis, erect, slightly scabrid, unequal, 2 inches or less long, bearing beyond the middle, or to the base on the shorter ones, 3 to 10 spikelets nearly sessile or on pedicels as long as themselves.

Spikelets slightly compressed, 3 to 4 lines long, 2-flowered, or with only 1 perfect flower; first empty glume narrowly ovate, acute, slightly carinate, thin, hispid on the keel, 1-nerved, $1\frac{1}{2}$ to 2 lines long; second empty glume broadly lanceolate, acute, hispid on the keel above, 3-nerved below, 1 line wide, 3 lines long; floral glume ovate-lanceolate, cleft $\frac{1}{3}$ way from the apex, somewhat chartaceous, membranaceous on the margins above, minutely scabrid, obscurely 5-nerved, 3 lines long; awn attached at base of cleft, hispid, twisted and bent, $\frac{1}{2}$ inch long, hairs of the distinct callus $\frac{1}{4}$ line long; internodes of rachilla villose, 1 to 2 lines long; palet lance-oblong, minutely 2-toothed at the apex, slightly arched, finely canescent on the two keels, thin, $2\frac{1}{2}$ lines long; grain spindle-shaped, slightly gibbous, light yellow, opaque, $1\frac{1}{2}$ lines long.

PLATE XLVII; *a*, spikelet enlarged 7 times; *b*, empty glumes; *c*, floral glume, dorsal view; *d*, palet, dorsal view; *e*, palet and internode of rachilla, side view.

California to southern Alaska.



TRISETUM CERNUUM Trin. Mém. Acad. St.-Peters. 1830. i. 61.

Plant perennial, loosely tufted, somewhat thickened at base.

Culms erect, smooth, 2 to 3 feet high.

Leaves of culm usually three; sheaths rather loose, open above, striate, smooth or scabrid above or even canescent, shorter than the internodes; blades flat, scabrid on both sides or nearly smooth beneath, 5 to 10 inches long, 3 to 6 lines wide; ligule ovate, lacerate, 1 to 6 lines long.

Inflorescence a rather loose, open, flexuose or nodding panicle 5 to 8 inches long; rays in twos, threes, or fours at the 7 to 10 nodes of the scabrid common axis, slender, flexuose, spreading, scabrid, bearing beyond the middle spikelets on pedicels 1 to 5 lines long.

Spikelets compressed, 2-, 3-, or rarely 4-flowered, 3 to 4 lines long; first empty glume narrowly ovate, acute, carinate, thin, minutely hispid on the keel, 1-nerved, 1 to $1\frac{1}{2}$ lines long; second empty glume broadly oblong, obtuse or acuminate, thin, hispid on the keel above, 3-nerved below, 2 to $2\frac{1}{2}$ lines long; awn arising below the base of the cleft, 3 to 5 lines long; hairs of the callus short; internode of the rachilla villose, 1 line long, upper one bearing a slender awn about one line long; palet oblong, erose at the obtuse apex, slightly arched, thin, minutely scabrid, hispidulous on the two keels, $1\frac{1}{2}$ lines long; grain narrowly oblong, light yellow, opaque, $1\frac{1}{2}$ lines long.

PLATE XLVIII; *a*, spikelet enlarged 6 times; *b*, empty glumes; *c*, floral glume, side view; *d*, palet, dorsal view; *e*, palet and internode of rachilla, side view.

Northern California to Alaska.



TRISETUM CERNUUM L.



ORCUTTIA CALIFORNICA Vasey, Bull. Torr. Club, xiii. 219.

Plant annual, in low, spreading clusters.

Culms geniculate, spreading, branching, slightly hairy, 2 to 4 inches long.

Leaves of culm 2 or 3; sheaths open, somewhat inflated, striate, sparsely hairy, about equaling the internodes; blades flat or folded, 1 inch long or less; ligule obsolete.

Inflorescence a simple panicle about 1 inch long, of 4 to 8 sessile spikelets, interrupted below, crowded above, often but a single pair of empty glumes for a cluster of 3 or more upper spikelets.

Spikelets compressed, broadly ovate, 12- to 20-flowered, 3 to 5 lines long; empty glumes oblong, convex, sparsely pubescent, 1 to 2 lines long, with usually 3 acute, 3-nerved lobes at the apex, the outer lobes longer; floral glume oblong, convex, scarious-margined, sparsely pubescent, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long with 5 narrow, acute, 3-nerved lobes, the middle lobes longer; palet oblong, erosely 4-toothed at the apex, thin, $1\frac{1}{2}$ to 2 lines long, with 2 rigid green keels; internodes of rachilla nearly smooth, $\frac{1}{4}$ line long, not extending beyond the base of the upper floret; stamens 3.

PLATE XLIX; *a*, plant, natural size; *b*, cluster of spikelets enlarged about 7 times; *c*, first empty glume; *d*, second empty glume; *e*, floral glume; *f*, palet; *g*, stamen and pistil.

Northern Lower California near the line and probably extending across the boundary into the United States.



ORCUTTIA GREENEI Vasey, Bot. Gaz. xvi. 146.

Plant apparently annual, in small tufts of about a dozen culms from a root.

Culms erect or ascending, rigid, terete, finely pubescent, 5 to 10 inches high.

Leaves of culm 5 to 8; sheaths open, loose, striate, pubescent or somewhat glabrate, shorter than the nearly equal internodes; blades erect, rigid, loosely involute, scabrid, 2 inches or less long; ligule obsolete.

Inflorescence a narrow, spicate, jagged panicle, 1 to 3 inches long, usually included at base in the upper sheath.

Spikelets sessile, appressed, ovate or oblong, compressed, 9- to 15-flowered, 4 to 6 lines long; empty glumes oblong, wider above, oblique, 3-toothed at the apex, scarious-margined, rigid, prominently 7- to 9-nerved, sparsely pubescent, about 2 lines long; second glume slightly larger; floral glume broadly oblong, somewhat carinate, rigid, scarious-margined, sparsely pubescent, $2\frac{1}{2}$ lines long, with 5 to 7 prominent nerves terminating in as many teeth and as many or more less prominent nerves terminating at the sinuses; palet oblong, wider toward the erosely 4-toothed apex, 2 lines long, with 2 rigid green keels; grain ovate-oblong, yellow, opaque, 1 line long; internode of rachilla $\frac{1}{2}$ line long, nearly smooth.

PLATE L; *a*, spikelet enlarged 4 times; *b*, floral glumes; *c*, palet, dorsal view.

Chico, northern California.





GRASSES OF THE PACIFIC SLOPE,

INCLUDING ALASKA AND THE ADJACENT ISLANDS.

PART II.

SCHIMDTIA SUBTILIS Tratt. Fl. Austr. i. 12 (1816).

Plant low, spreading, annual.

Culms geniculate and often branched below, ascending, slender, 1 to 3 inches tall.

Leaves two or three on each culm; sheaths rather scarious, loose, open above, the upper one vaginate; blades flat or folded, curved backward, smooth, $\frac{1}{2}$ inch long and 1 line or less wide; ligule ovate, acute, decurrent, 1 to 2 lines long.

Inflorescence a rather spreading, interrupted, flexuous panicle $\frac{1}{2}$ to 1 inch long, simple or branched below, with spikelets in umbellate clusters at the nodes of the axis and extremities of the branches, on pubescent pedicels 3 lines long or less.

Spikelets 1-flowered, about $\frac{1}{2}$ line long; floral glume lanceolate, acuminate, awn-pointed, thin, membranaceous, except the hispidulous excurrent midnerve, $\frac{1}{2}$ line long; palet broadly obovate, 2- or 3-lobed or toothed above, about $\frac{1}{3}$ line long, thin, membranaceous, except the two hispidulous, divergent, slightly excurrent keels; stamens 2, with short anthers; ovary elliptical, smooth, $\frac{1}{2}$ line long, with 2 feathered stigmas; ripened grain reddish, $\frac{1}{3}$ line long, falling free.

PLATE LI, No. 1; *a*, spikelet opened slightly; *b*, floral glume, dorsal view; *c*, palet, ventral view, half opened.

Oregon and Washington, in low, muddy land. Too small and scarce to be of any practical value. The name was changed to *Coleanthus subtilis* Seid. in R. & S. Syst. ii. 276 (1817), because an older genus *Smithia* was held to conflict with the use of *Schmidtia*. The plate was lithographed before the recent changes in nomenclature reinstated the older generic name.

PHIPPSIA ALGIDA R. Br. Chlor. Melv. 285 (1823).

Plant low, caespitose or densely tufted, perennial, with abundant, long, fibrous roots.

Culms branched below, ascending, rather robust, smooth, 3 to 6 inches long.

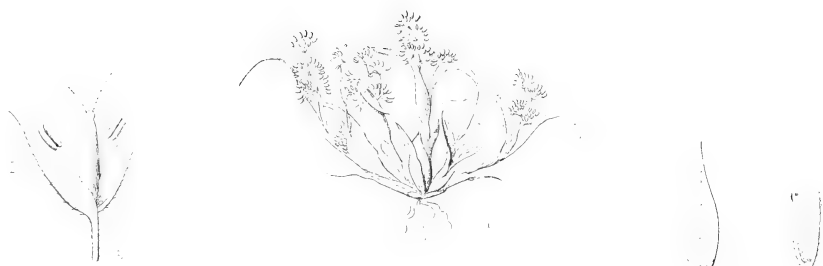
Leaves of culm 2 or 3, with loose, open, rather scarious, smooth sheaths nearly equaling the internodes, and flat or folded, obtuse, smooth blades 2 inches or less long; ligule membranaceous, 1 line or less long.

Inflorescence an oblong, rather closely flowered panicle about 1 inch long; rays 4 or 6 in semiverticillate clusters, unequal, $\frac{1}{2}$ inch long or less, erect, divided, and spikelet-bearing near the extremities.

Spikelets obovate, somewhat compressed, 1-flowered, $\frac{2}{3}$ line long; empty glumes obtuse, less than $\frac{1}{4}$ line long, caducous; floral glume lance-oblong, obtuse, or barely acute, usually denticulate above, smooth, obscurely 3-nerved, $\frac{2}{3}$ line long; palet obovate, oblong, obtuse, or more or less 3-lobed above, nearly smooth on the 2 divergent keels; stamens 2; grain broadly elliptical, tuberculate, roughened, about equaling the glumes at maturity.

PLATE LI, No. 2; *a*, spikelet opened; *b*, floral glume; *c*, palet, dorsal view, partly opened.

Alaska and Arctic America. Its mode of growth in dense masses would indicate that it might form a considerable portion of the forage of the herbivorous animals of the region.



1 COLEANTHUS SUBTILIS L.
2 PHIPPSIA ALGIDA F. & M.

H. P. Schell del.



ARCTAGROSTIS LATIFOLIA (R. Br.) Griseb. in Ledeb. Fl. Ross. iv. 434 (1853); *Colpodium latifolium* R. Br. Chlor. Melv. 286 (1823).

Plant perennial, with strong, creeping rootstock, usually purple in the inflorescence.

Culms erect or slightly decumbent at the base, robust, smooth, leafy nearly to the panicle, 6 to 12 inches tall.

Leaves of the culm usually 3; sheaths loose, open above, smooth, usually exceeding the internodes; blades flat, striate, scabrous above, 2 to 4 lines wide, 2 to 4 inches long; ligule usually lacerate at the obtuse apex, 2 lines long.

Inflorescence a rather closely flowered, contracted panicle, 2 to 5 inches long; rays in semiverticillate clusters of 3 to 5 at each of the 6 to 8 nodes, appressed or slightly spreading, unequal, an inch long or less, spikelet-bearing to the base, or the longer ones sometimes naked below.

Spikelets 2 to 2½ lines long, 1-flowered, with a slender capillary rudiment; empty glumes broadly lance-oblong, acute or subacute, thin, smooth, the first 1-nerved, 1 to 1½ lines long, the second ¼ line longer and 3-nerved; floral glume broadly lance-oblong, subacute or often mucronulate, minutely roughened throughout, slightly pubescent on the keel below, obscurely 5-nerved, 2 lines long; palet broad and glumaceous in form and texture, margins not infolded, purple like the glume and about equaling it in length, pubescent on the 2 nerves; stamens 3, with short filaments and yellow anther 1 line long.

PLATE LII; *a*, spikelet with floret and rudiment lifted out and opened to show the stamens; *b*, first empty glume; *c*, second empty glume; *d*, floral glume; *e*, palet.

Alaska to Greenland. This species resembles *DuPontia Fisheri* more nearly than any other of the same region, but that is readily distinguished by its long, golden, empty glumes.



ALYTRIOPSIS LAMPANA



AGROSTIS FOLIOSA Vasey, Bull. Torr. Club, xiii. 55 (1886).

Plants perennial, from a creeping rootstock, tufted.

Culms erect or decumbent at the base, leafy throughout, smooth, 1 to 2 feet tall.

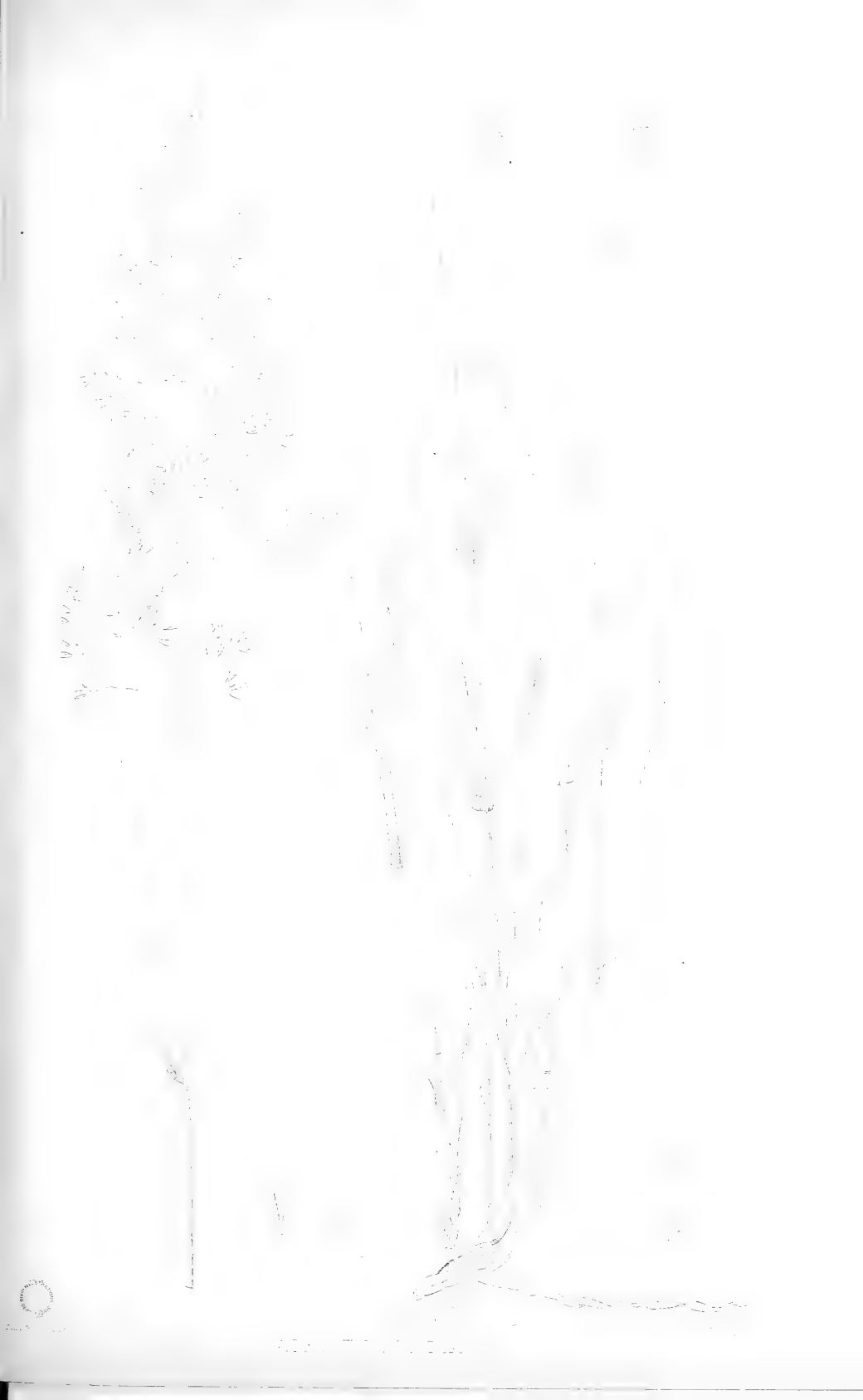
Leaves of the culm 3 to 5; sheaths smooth, close, equaling or often exceeding the internodes; blades flat, long pointed, hispidulous or nearly smooth, 2 to 3 lines wide, 4 to 8 inches long; ligule obtuse, 1 to 2 lines long.

Inflorescence a loose, oblong, erect panicle, 3 to 6 inches long; rays 3 to 7 at each of the 7 to 9 nodes, slender, scabrid, 2 inches long or less, subdivided, and spikelet-bearing beyond the middle or nearly to the base.

Spikelets 1-flowered, 1 to 1½ lines long; empty glumes, ovate, acute, hispid on the keel, or the second usually smooth, 1-nerved, equal, or the first slightly larger, 1 to 1½ lines long; floral glume ovate-oblong, nearly equaling the empty glumes, smooth except a slight tuft of hairs at the base, 4-nerved above, the nerves terminating in 4 short teeth; awn arising at the middle or below, ½ to 2 lines long; palea wanting; grain ½ line long.

PLATE LIII; *a*, spikelet with floret lifted out of the empty glumes; *b*, floral glume not opened at the base, dorsal view; *c*, floral glume, ventral view.

Oregon and Washington, in the mountains. This species is rather variable and difficult to define, like some others of the same genus in this region. Its stoloniferous, perennial habit and abundant foliage indicate that it might be valuable for pasturage



AGROSTIS MICROPHYLLA Steud. Syn. Pl. Gram. 164 (1855).

Plant annual, loosely tufted, with slender, fibrous roots.

Culms erect, often branched at the base, slender, smooth, constricted at the black nodes, 6 to 15 inches tall.

Leaves of the culm 2 or 3; sheaths nearly smooth, closed, shorter than the internodes; blades erect, scabrid, flat, or loosely involute, 2 inches long or less; ligule usually lacerate, 1 to 2 lines long.

Inflorescence a close-flowered, spike-like panicle, $1\frac{1}{2}$ to 3 inches long, light-green or purplish, the numerous exerted awns giving it a feathery appearance; rays in semi verticillate clusters at the 5 to 7 nodes, unequal, barely exceeding the intervals, $\frac{1}{2}$ inch long or less, divided and crowded to the base with pedicellate, appressed spikelets.

Spikelets 1-flowered, $1\frac{1}{2}$ to 2 lines long; empty glumes nearly equal, subulate-pointed, thin, hispid on the keels, 1-nerved, $1\frac{1}{2}$ to 2 lines long; floral glume broadly oblong, 4-toothed at the apex, smooth except the few minute hairs at the base, thin, obscurely 4-nerved, 1 line long or less; awn arising above the middle, hispidulous, slender, 2 to 3 lines long; palea wanting; stamens 3, the short anthers scarcely exerted.

PLATE LIV; *a*, spikelet with glumes in position; *b*, first empty glume; *c*, second empty glume; *d*, floral glume, side view; *e*, same opened, dorsal view.

California to Oregon, mostly on the coast ranges and foothills. This species has been referred to *A. exarata*, as it resembles some of the small forms of that variable species, but it may be distinguished by the smaller leaves, slender culms, and long awns.



AGROSTIS MICROPHYLLA Steud

A. Mayr del.



CALAMAGROSTIS ARCTICA Vasey, sp. nov.

Plant perennial, from a creeping rootstock.

Culms decumbent at base, smooth, 5 to 10 inches tall, covered below with persistent, scarious sheaths.

Leaves from the base, numerous, flat, smooth, 2 lines wide, half as long as the culm; but 1 or 2 above the decumbent base, these with rather long sheaths loose above, half open at the throat, smooth and thin; the blades erect, flat, or folded, about 1 inch long; ligule nearly acute, about $1\frac{1}{2}$ lines long.

Inflorescence, a dense, short, spicate panicle, 1 inch long and $\frac{1}{3}$ inch wide, rays $\frac{1}{4}$ inch long, in glomerate clusters.

Spikelets 1-flowered, 2 to $2\frac{1}{2}$ lines long; empty glumes narrowly lance-ovate, attenuate-pointed, hispid on the keels and minutely scabrid throughout, purple below, the first 1-nerved and slightly longer, the second 3-nerved, 2 to $2\frac{1}{2}$ lines long; floral glume oblong, acutely 4-toothed at the apex, smooth, purple above, 4-nerved, 2 lines long; awn arising near the base, $2\frac{1}{2}$ to 3 lines long, exserted beyond the empty glumes; palea oblong, 2-toothed at the apex, nearly smooth on the keels, about equaling its glume; hairs of the callus and sterile pedicel one-fourth as long as the floret.

PLATE LV; *a*, spikelet dissected, showing all the parts somewhat spread; *b*, floral glume, dorsal view.

St. Paul Island, Bering Sea. Collected by J. M. Macoun, 1891.



CALAMAGROSTIS ARCTICA Vesp.

W.E. Schell, del.



CALAMAGROSTIS NEGLECTA (Ehrh.) Gaertn. Fl. Wett. i. 94 (1799);

Arundo neglecta Ehrh. Beitr. vi. 137 (1791).

Plant perennial, tufted, from a strong rootstock.

Culms erect, simple, nearly smooth, leafy nearly to the panicle, 1 to 2 feet tall.

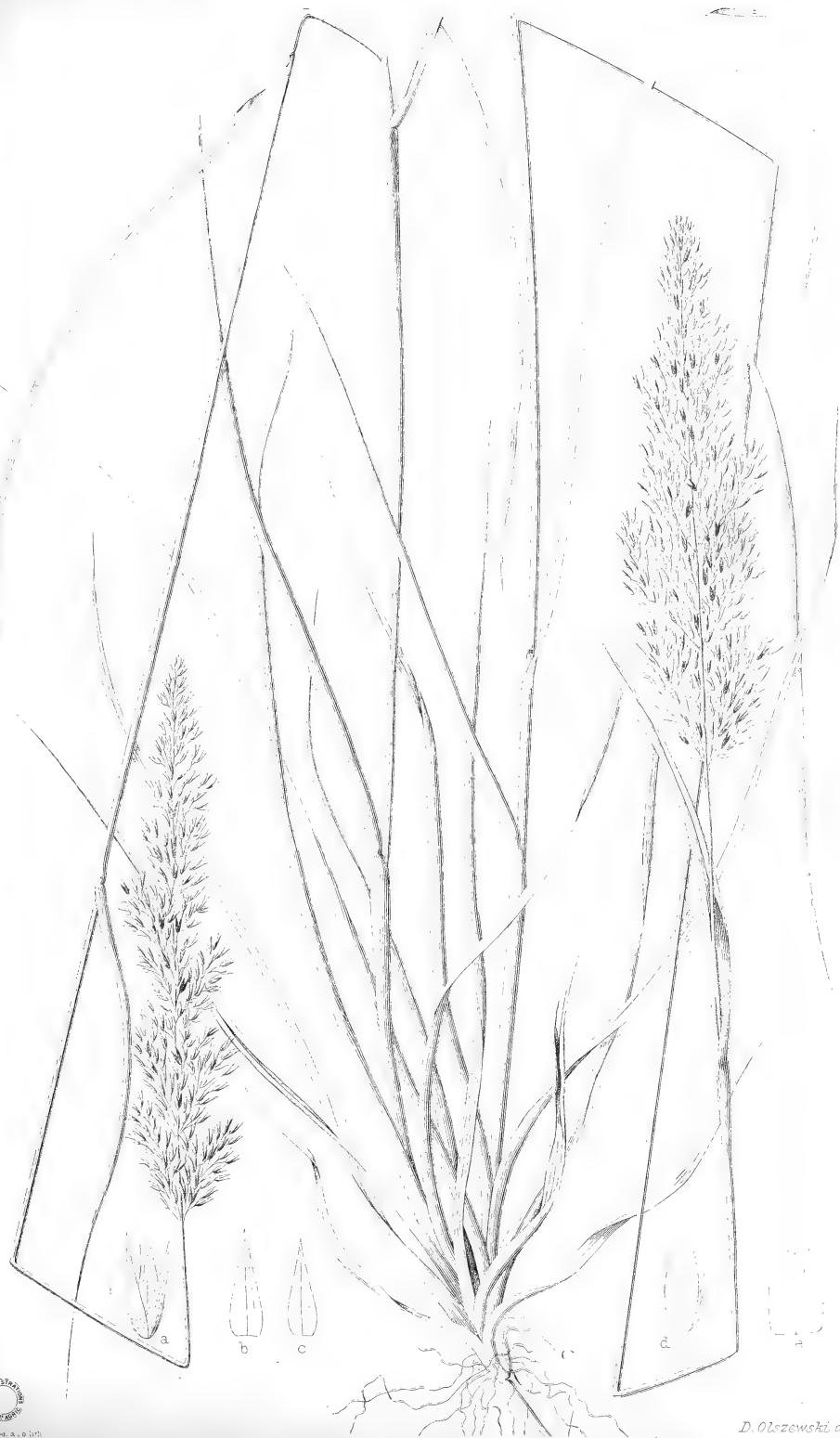
Leaves of the radical-tuft numerous, with open, smooth, chartaceous sheaths and slender, involute, rather rigid, sharp-pointed blades half as long as the culm: leaves of the culm 2 or 3; sheaths striate, nearly smooth, close, half open at the throat, nearly as long as the internodes; blades erect, involute, 3 to 6 inches long; ligule acute, decurrent, 1 to 2 lines long.

Inflorescence an erect, closely-flowered, narrow, oblong panicle 2 to 4 inches long; rays 4 to 6, in semiverticillate clusters at each of the 7 to 10 nodes of the hispid axis, triangular, hispid, erect or spreading, unequal, 1 inch long or less, subdivided and spikelet-bearing beyond the middle.

Spikelets turgid, $1\frac{1}{2}$ lines long, with 1 perfect flower and a pilose rudiment; empty glumes nearly equal, ovate, acute, slightly scabrous and hispid on the keels, obscurely 3-nerved, $1\frac{1}{2}$ lines long; floral glume broadly oblong, erose-dentate at the truncate apex, smooth, 4-nerved, 1 to $1\frac{1}{4}$ lines long; awn arising above the middle, barely exceeding the apex of the glume; palet broadly oblong, obtuse, half as long as the glume; hairs of the callus and rudiment one-half to two-thirds as long as the floret.

PLATE LVI; *a*, spikelet; *b*, first empty glume; *c*, second empty glume; *d*, floret, side view with the palet and rudiment brought out from the enveloping glume; *e*, floral glume spread out, dorsal view.

Oregon to Alaska and in northern Labrador. This form agrees well with the specimens from Scandinavia, marked *Arundo stricta* Timm., *Calamagrostis stricta* Hartmann, and *Deyouzia neglecta* Ehrh. The figure, however, represents a broader panicle state than is usual. The name has been applied to a species from the high interior plains, which is *C. robusta* Vasey.



CALAMAGROSTIS NEGLECTA Gaertn.

D. Olczewski del.

CALAMAGROSTIS SYLVATICA var. Longifolia Vasey, Contr.
Nat. Herb. iii. 83 (1892).

Plant perennial, densely tufted, with numerous sterile shoots from a creeping rootstock.

Culms erect, simple, or branched at the base, leafy nearly to the panicle, 10 to 15 inches tall.

Leaves of sterile shoots numerous, with close sheaths and involute blades equaling the culms: leaves of the culm 2 or 3; sheaths nearly smooth, striate, rather loose above, half open at the throat, equaling or exceeding the internodes; blades flat or loosely involute, setaceously pointed, scabrid above, equaling those of the sterile shoots; ligule obtuse, 1 to 2 lines long.

Inflorescence a close-flowered, erect, spike-like panicle 2 to 4 inches long; rays 4 to 6 at each of the 8 to 10 nodes, erect or almost appressed, unequal, $\frac{1}{2}$ inch long or less, divided and spikelet-bearing to the base.

Spikelets 3 to 4 lines long, with 1 perfect floret and a pilose, sterile pedicel; empty glumes divergent, nearly equal, exceeding the floret, lance-ovate, acute or awn-pointed, nearly smooth, 3 to 4 lines long, the first 1-nerved, the second 3-nerved; floral glume ovate-oblong, 2-lobed, each lobe terminating in two setaceous points formed by the 4 hispid, excurrent nerves, membranaceous and smooth below, $2\frac{1}{2}$ to 3 lines long; awn arising below the middle, 4 to 5 lines long, much exceeding the glumes; palea lance oblong, 2-toothed at the apex, thin, the 2 keels contiguous above, $\frac{1}{2}$ line shorter than the glume; grain cylindrical, with a furrow on one side, yellow, $1\frac{1}{2}$ to 2 lines long; hairs of the callus half as long as the floret, and those of the rudiment two-thirds as long.

PLATE LVII; *a*, spikelet with glumes spread somewhat to show the floret and sterile pedicel; *b*, first empty glume; *c*, second empty glume; *d*, floral glume, dorsal view; *e*, palea.

Collected by H. N. Bolander (No. 6470) along the Mattole River, Humboldt County, California. Well marked by the long, involute leaves and the conspicuous hairs of the callus.



Printed by A. & S. 1900

CALAMAGROSTIS SYLVATICA DC. VAR. LONGIFOLIA Vasey.

K. Mayo del.

DESCHAMPSIA ELONGATA (Hook.) Munro. in Benth. Pl. Hartw. 342 (1857); *Aira elongata* Hook. Fl. Bor. Amer. ii. 243 (1840?).

Plant annual, tufted, with fibrous roots.

Culms erect, simple, slender, smooth, naked above, 12 to 18 inches tall.

Leaves of culm usually 2, the first with a very short, open sheath and slender, involute blade 3 to 6 inches long, the second with long, smooth, striate sheath, rather loose and half open above, and a slender, involute blade 1 to 3 inches long; ligule membranaceous, nearly acute, 1 to 2 lines long, decurrent.

Inflorescence a linear, strict, erect or slightly nodding panicle 6 to 8 inches long; rays mostly in twos, unequal, 2 inches or less long, erect, scabrous, bearing 3 to 5 spikelets on appressed pedicels.

Spikelets lanceolate, somewhat compressed, $2\frac{1}{2}$ to 3 lines long, 2-flowered, with a rudiment of a third; empty glumes nearly equal, lanceolate, acute, purplish above, slightly hispid on the keel, 3-nerved, $2\frac{1}{2}$ to 3 lines long; floral glume broadly oblong, equally 4-toothed at the truncate apex, convex, membranaceous, smooth except the few pilose hairs at the base, obscurely 5-nerved, 1 to $1\frac{1}{2}$ lines long; awn arising near the middle, about 1 line long; palea broadly lance-oblong, 2- or 4-toothed at the apex, slightly hispid on the 2 keels; grain elliptical, yellow, $\frac{2}{3}$ line long; lodicules usually present but small; internode of rachilla $\frac{2}{3}$ line long, pilose especially above.

PLATE LVIII; *a*, spikelet partly dissected; *b*, floret; *c*, floral glume, dorsal view.

California, near the coast in the vicinity of San Francisco and northward to Oregon. Also extending eastward to Idaho and Montana. In some localities very abundant, and furnishing a considerable amount of pasturage.



DESCHAMPSIA HOLCIFORMIS Presl. Rel. Haenk. i. 251 (1830).

Plant perennial, tufted, with numerous sterile shoots from a creeping rootstock.

Culm erect, simple, terete, striate, smooth, rather robust, 20 to 30 inches tall.

Leaves of radical tufts, and of sterile shoots, with smooth, chartaceous sheaths and slender, involute blades 8 to 12 inches long: leaves of the culm usually 2; sheaths smooth, striate, rather loose, half open above, exceeding the internodes; blades involute, rather rigid, scabrid on the prominent nerves above, about 1 line wide, 3 to 6 inches long; ligule membranaceous, nearly acute, decurrent, 2 lines long.

Inflorescence an erect, closely flowered, somewhat interrupted, lance-oblong panicle, 4 to 6 inches long; rays 3 to 7, in glomerate clusters at the 8 to 10 nodes of the slightly hispid axis, ascending, 1 inch long or less, subdivided, and densely flowered nearly to the base with short-pedicelled, appressed spikelets.

Spikelets oblanceolate, slightly compressed, 2-flowered with a sterile rudiment, 3 lines long; first empty glume lance-oblong, acute, carinate, hispid on the keel, 2 lines long; second empty glume broadly lanceolate, acute, convex, 3-nerved, hispid on the keel, 2½ lines long; floral glume oblong, equally 4-toothed at the truncate apex, convex, thicker than the empty glumes, minutely scabrid, pilose at the base, 5-nerved, 2 lines long; awn slender, 1 line long, arising below the middle sinus; palea broadly lance-oblong, emarginate at the apex, slightly hispid on the 2 keels; grain elliptical, ½ line long, nearly equaled by the 1 or 2 lodicules; rachilla and sterile pedicel pilose, each 1 line long.

PLATE LIX; *a*, spikelet partly dissected; *b*, floret opened; *c*, first empty glume; *d*, second empty glume; *e*, floral glume.

California, near the coast. It is probably of some value for hay and forage in the low marshes along the coast. It varies greatly under different conditions, some forms with loose panicles even approaching *D. caespitosa*.



HALIMOLOBOS HOLCIFORMIS Presl.

Dr. Schott del.

Bromus Trinit Desvcaux. No. 60.

TRISETUM BARBATUM Steud. Syn. Pl. Gram. 229 (1855).

Plant perennial, few culms in a stool, with fibrous roots.

Culms erect, or decumbent at the base, often branched below, smooth, leafy nearly to the panicle, 2 to 3 feet tall.

Leaves of the culm 3 or 4; sheaths sparsely retrorsely hispid, half open above, shorter than the internodes; blades scabrid, sparsely hairy or nearly smooth, 2 to 3 lines wide, 3 to 6 inches long; ligule obtuse, erose, 1 line or less long.

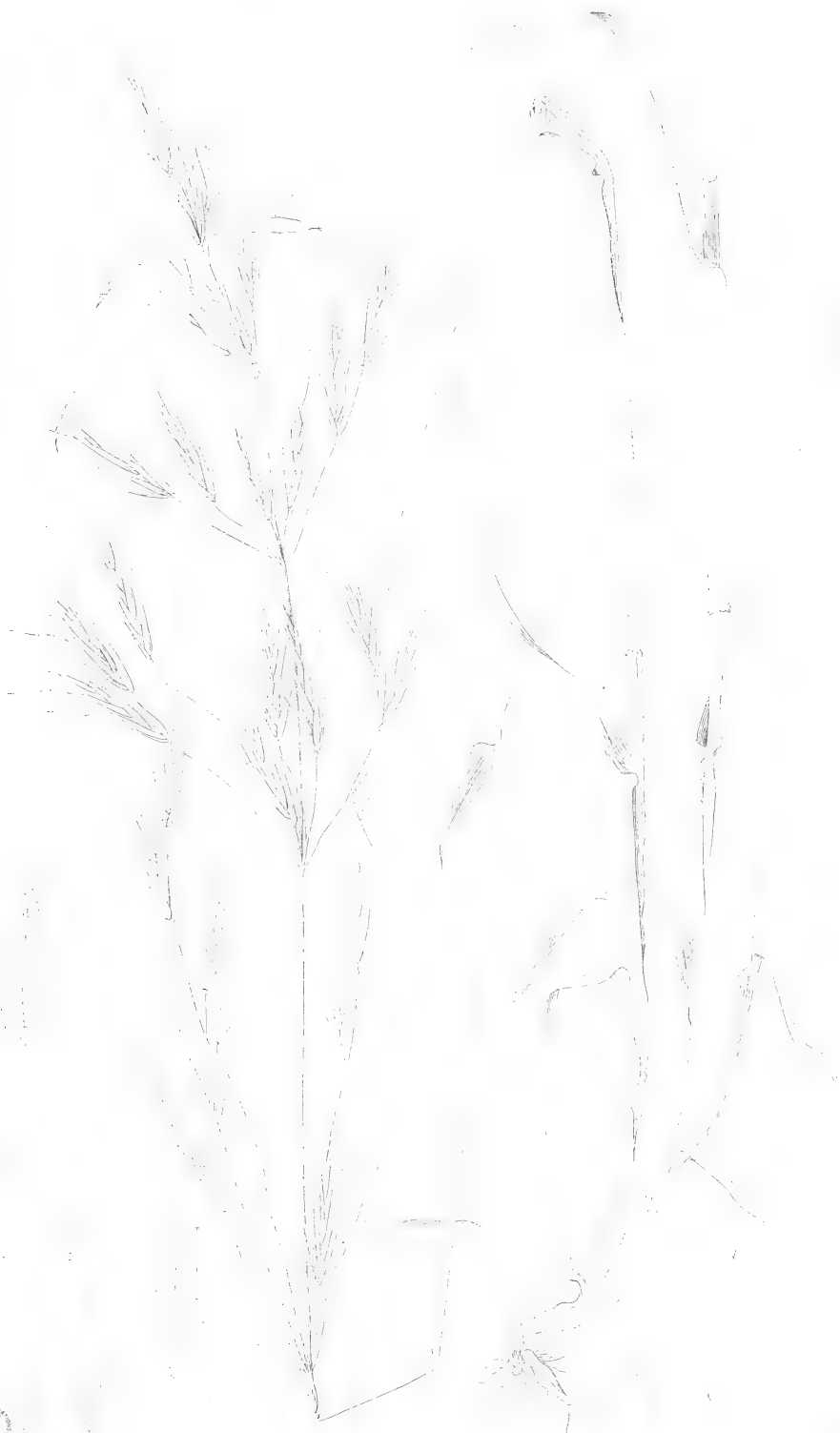
Inflorescence a loose, open, or often rather constricted, erect or flexuous panicle 4 to 8 inches long; rays 2 to 5 at each of the 4 to 6 nodes, scabrid like the axis, unequal, 3 inches long or less, spikelet-bearing toward the ends.

Spikelets loosely 3- to 6-flowered, 7 to 10 lines long; first empty glume very narrowly ovate, subulate-acute, carinate, membranaceous and smooth, except the prominent, slightly hispid keel, 3 to 4 lines long; second empty glume lance-ovate, acute, often involute subulate, slightly hispid on the keel, 3-nerved, 5 to 6 lines long; floral glume lanceolate, with two teeth, each about $\frac{1}{2}$ line long, at the apex, pubescent throughout, 5- to 7-nerved, 5 to 7 lines long; awn arising at the base of the sinus, rather coarse, hispid and slightly twisted below, bent, $\frac{1}{2}$ to $\frac{3}{4}$ inch long; palet linear, thin, ciliate on the keels above, 4 to 5 lines long; grain spindle-shaped, reddish-brown, subtranslucent, 3 to 4 lines long; internode of rachilla slender, about $1\frac{1}{2}$ lines long.

PLATE LX; *a*, first empty glume; *b*, second empty glume; *c*, floral glume, side view; *d*, floral glume, dorsal view; *e*, palet, not opened; *f*, grain.

Southern California. The description in Botany of California seems to include in some characters the variety *major* Vasey, which differs from the type in having larger spikelets and broader empty glumes more or less plainly 3- and 5-nerved, respectively.

Prof. Thurber, in Botany of California, is authority for the reference of this species to *T. barbatum* Steudel, and only from description. The name does not occur in Fournier's Graminées Mexicaines, and we have seen no authentic specimens of the species.



TRICATYUM PARVATUM

DANTHONIA CALIFORNICA Boland. Proc. Cal. Acad. ii. 182⁷ (1862).

Plant perennial, usually pale green, often purple in the inflorescence.

Culms erect, or geniculate at the lower nodes, smooth, slender, thickened at the base, leafy nearly to the panicle, 1 to 2½ feet tall.

Leaves of radical shoots numerous, with short sheaths and slender, involute blades 4 to 8 inches long: leaves of the culm 4 to 6; sheaths rather loose, closed at the hairy throat, striate, usually pubescent, mostly shorter than the nearly equal internodes; blades flat or loosely involute, scabrous, especially toward the involute points, often thinly pubescent, 2 to 5 inches long; ligule nearly obsolete.

Inflorescence a short, simple panicle of 3 to 8 spikelets on spreading, flexuous pubescent pedicels about equaling the spikelets.

Spikelets cuncate, compressed, 5- to 8-flowered, 6 to 8 lines long; empty glumes lance-ovate, with long, carinate or involute points which are obtuse when unrolled, indistinctly 3- to 7-nerved, about equal, 6 to 7 lines long; floral glume broadly lance-oblong, acuminate, with 2 teeth 1 line long at the apex, smooth except a tuft of pilose hairs midway on each margin or often slightly ciliate on the margins throughout, 9- to 11-nerved, 4 to 5 lines long; awn arising at the base of the sinus, slightly hispid, often twisted and bent, 3 to 5 lines long; palea oblong, 3-toothed at the apex, margins flatly infolded, ciliate on the prominent keels, 3 to 3½ lines long; stamens 3, with brown anthers, 1½ lines long, exserted; ovary smooth; grain opaque, nearly 2 lines long; lodicules 2, rather fleshy, 3-lobed above, ½ line long; internode of rachilla pubescent, less than ½ line long, the upper joint usually bearing an awned rudiment.

PLATE LXI; *a*, spikelet with florets spread somewhat; *b*, first empty glume; *c*, second empty glume; *d*, floral glume; *e*, palea; *f*, floret.

Central California northward to Washington and eastward to Nevada and Montana.



Julius E. Smith & Co. 1870

DANTHONIA CALIFORNICA Bolander

MELICA BROMOIDES Gray, Proc. Amer. Acad. viii. 409 (1873).

Plant perennial, tufted, bulbous at the base.

Culms erect, simple, slender, smooth, 2 to 4 feet tall.

Leaves of culm 4 to 6; sheaths retrorsely scabrid, close, half open at the throat, mostly shorter than the internodes; blades flat or loosely involute, scabrid above, slender-pointed, $1\frac{1}{2}$ to 4 lines wide, 6 to 12 inches long; ligule membranaceous, roundish obtuse, about 1 line long.

Inflorescence, a loose, erect, or somewhat flexuous panicle, often secund, 6 to 10 inches long; rays mostly in twos at the 6 to 8 rather distant nodes of the scabrous common axis, 3 inches long or less, bearing pedicellate spikelets beyond the middle or scattered throughout.

Spikelets lanceolate, compressed, rather loosely 4- to 6-flowered, 6 to 9 inches long; empty glumes ovate, acute, smooth, membranaceous above, purple below, the first 3-nerved at base, 2 to 3 lines long, the second 1 line longer and 5-nerved below; floral glume broadly lanceolate, usually unequally 2-toothed or emarginate, scarious-margined above, minutely scabrid, 7-nerved, 4 to 5 lines long; palet lance-oblong, nearly acute at the apex, pubescent on the 2 keels, 3 to $3\frac{1}{2}$ lines long; stamens 3, on slender filaments.

PLATE LXII; *a*, spikelet; *b*, empty glumes; *c*, floral glume, dorsal view; *d*, palet with margins infolded.

California to Oregon, in the mountains. It would probably be valuable in cultivation on the higher mesas.



MELICA BROMOIDES Gray

Thảo Hoãn, oải hương dẻ

MELICA BULBOSA Geyer. Hook. Journ. Bot. & Misc. viii. 10 (1856).

Plant perennial, tufted, bulbous at the base, with rather coarse roots.

Culms erect, simple, slender, smooth, 1 to 2 feet tall.

Leaves of culm 3 to 6; sheaths retrorsely scabrid or nearly smooth, close, closed to the throat, exceeding the internodes; blades flat or involute, attenuate pointed, scabrous on both sides, mostly erect, 5 to 10 inches long; ligule obtuse or often dentate, 2 lines long.

Inflorescence an erect, strict, linear panicle 4 to 6 inches long; rays mostly alternate, erect, scarcely exceeding the intervals, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long, bearing 1 to 4 erect, pedicellate spikelets scattered along the entire length.

Spikelets rather turgid, lance-oblong, 4 to 5 lines long, 3- to 6-flowered, with a rudiment; first empty glume oblong, obtuse, thin, 3- to 5-nerved, 3 lines long; second empty glume oblanceolate, obtuse, minutely scabrid, 5- to 7-nerved, $3\frac{1}{2}$ to 4 lines long; floral glume broadly oblanceolate, obtuse or barely acute, scabrid, purple above, 7-nerved, $3\frac{1}{2}$ to 4 lines long; palea oblanceolate, ciliate at the rounded apex and on the two keels, which are nearly marginal and inarched above, $2\frac{1}{2}$ to 3 lines long; internode of rachilla nearly glabrous, $\frac{2}{3}$ line long.

PLATE LXIII; *a*, spikelet with florets in natural position; *b*, spikelet with florets spread and opened to show the different parts; *c*, floral glume, dorsal view.

California to Washington, mostly in the Sierra Nevada and Cascade ranges. Its bulbous, perennial character, slender culms, and abundant leaves indicate that it might be of considerable value. It is a rather pretty and attractive grass, as is evidenced by the amount of attention and the number of names that botanists have given it. The species described as *M. bulbosa* in Botany of California is plainly something different from Geyer's species.



MELICA BULBOSA Geyer

W.R. Schoff del.



MELICA FRUTESCENS Scribn. Proc. Acad. Phila. for 1885, 45 (1885).

Plant perennial, tufted, or in small bunches, with rather strong roots.

Culms erect, simple, or branched below, stout and almost woody at the base, leafy throughout, $2\frac{1}{2}$ to $3\frac{1}{2}$ feet tall.

Leaves of culm 5 to 7, or on the branching forms more numerous; sheath striate, somewhat retrorsely scabrid, closed, usually purple below, exceeding the internodes; blades flat or involute toward the slender points, scabrid on both sides, 5 to 12 inches long; ligule acute, lacerate, or thinly fimbriate, 2 to 4 lines long.

Inflorescence an erect, strict, linear panicle, somewhat interrupted below, almost spicate above, 6 to 12 inches long; rays mostly in pairs, unequal, 3 inches long or less, appressed, spikelet-bearing to the base or the longer ones naked below.

Spikelets oblanceolate, turgid, 5 to 7 lines long, with usually 5 perfect flowers and a more or less developed rudiment; first empty glume lanceolate, acute, often denticulate near the apex, thin, minutely scabrid, 5- to 7-nerved, 5 lines long; second empty glume oblanceolate, acute, thin, membranaceous above, 7-nerved, 6 lines long; floral glume lanceolate, obtuse, thin, herbaceous, and 7-nerved to the middle, thin, membranaceous above, minutely scabrid throughout, 4 to $4\frac{1}{2}$ lines long; palet oblanceolate, rounded at the apex, nervose, minutely scabrid, ciliate on the keels, which are arched and nearly marginal above, 2 lines long; grain oblong, with a slight beak, brown, flat on one side, wrinkled, 1 line long; internode of rachilla minutely pubescent, disarticulating at the base of each floret.

PLATE LXIV; *a*, panicle of the larger form; *b*, spikelet with florets spread about as they are at maturity; *c*, floret of larger-flowered form; *d*, floret of typical form; *e*, grain.

Southern California and adjacent Lower California and Mexico. Somewhat bunched (growing in dense clumps) in the vicinity of San Diego; less so at higher elevations. The thin, papery tips of the glumes give the panicle a white appearance.



MELICA FRUTESCENS. Vahl.

W. S. 17. 172. 172.

MELICA FUGAX Boland. Proc. Cal. Acad. iv. 404 (1870).

Plant perennial, strongly bulbous, with a contorted rootstock bearing the remains of old bulbs, roots finely lanate.

Culms erect, rarely branched, slender, wiry, retrorsely hispid, naked above, 1 to 2 feet tall.

Leaves of culm 1 or 2; sheaths retrorsely scabrid, close, half open at the throat, exceeding the short, lower internodes; blades flat or somewhat involute toward the attenuate points, scabrous or minutely pubescent, 1 to 2 lines wide, 3 to 6 inches long; ligule lacerate, about 1 line long.

Inflorescence a loose, open, erect panicle, 4 to 6 inches long, rarely unexpanded and linear, often with small, lateral panicles in the upper sheath; branches mostly in twos or threes at the 4 or 5 rather distant nodes, unequal, horizontal, bearing 1 to 4 spikelets toward the extremities.

Spikelets oblong, about 5 lines long, with 2 to 4 perfect florets and a rudiment, erect and imbricated, deciduous; first empty glume broadly ovate-oblong, obtuse, often toothed on one or both sides below the apex, smooth, purple, 1-nerved, scarious-margined, $1\frac{1}{2}$ lines long; second empty glume broadly lanceolate, obtuse or barely acute, smooth, obscurely 3- to 5-nerved, scarious-margined, $2\frac{1}{2}$ lines long; floral glume broadly obovate-oblong, minutely roughened, purple near the narrow, scarious margin, 7-nerved, 2 to 3 lines long and more than half as wide; palea lance-oblong, obtuse, minutely pubescent on the arched keels, slightly shorter than the glume; grain oblong, curved, 1 line long; internode of rachilla yellow, tuberculate, glabrous.

PLATE LXV; *a*, spikelet with mature florets in position; *b*, spikelet partly dissected and the parts of the florets spread open.

California to Washington, mostly in the mountain valleys. Evidently a grass of some promise if introduced in cultivation.

MELICA HARFORDII Boland. Proc. Cal. Acad. iv. 102 (1870).

Plant perennial, tufted or in "bunches," with a rootstock and rather coarse roots, but not bulbous.

Culms erect, branched below, slender, rather wiry, smooth, leafy nearly to the panicle, 3 to 5 feet tall.

Leaves of culm about 5; sheaths slightly scabrid, striate, closed, about equaling the internodes; blades flat or involute, scabrid above, slender pointed, somewhat auriculate-lobed at base, 1 to 3 lines wide, 6 to 10 inches long; ligule 1 to 2 lines long.

Inflorescence a linear, strict, erect or slightly nodding panicle, 6 to 12 inches long, including the lower node which is usually distant from the others; rays mostly in twos at the 5 or 6 nodes, scabrous, erect or appressed, unequal, 2 inches long or less, bearing 1 to 3 erect, short-pedicelled spikelets.

Spikelets narrowly lanceolate, 5 to 7 lines long, the florets well imbricated or at length somewhat spreading, readily disarticulating even in young specimens; empty glumes oblanceolate, obtuse or barely acute, minutely scabrid, purple-nerved, the first 5-nerved, 3 to 4 lines long, the second $\frac{1}{2}$ line longer and 5- to 7-nerved; floral glume lanceolate, barely acute or emarginate or sometimes short-awned, scarious-margined above, minutely appressed, silky throughout, pilose on the marginal nerves below the middle, 7- to 9-nerved, 4 to 5 lines long; palea oblong, obtuse or emarginate, pubescent on the two arched keels, 3 to 4 lines long; grain linear, 2-horned at the apex, dark purple, 2 lines long.

PLATE LXVI; *a*, spikelet with florets spread out; *b*, floret with awned glume; *c*, floral glume, dorsal view.

California to Washington, mostly in the mountain valleys and on the foot hills. Less likely to be of value in cultivation, because of its bunched habit and rather stiff culms.



MELICA STRICTA Boland. Proc. Cal. Acad. iii. 4 (1863).

Plant perennial, densely tufted, pale green with whitish inflorescence, or purple and brown in the inflorescence and lower sheaths.

Culms erect, or geniculate below, branched at base, retrorsely velvety-pubescent or scabrous, leafy nearly to the panicle, 1 to 2 feet tall.

Leaves of culm 2 or 3; sheaths striate, retrorsely velvety-pubescent, closed to the throat, exceeding the internodes; blades flat or involute toward the rather rigid points, subauriculate at base, velvety-pubescent on both sides or scabrid above, erect, 1 to 2 lines wide, 3 to 4 inches long; ligule about 2 lines long.

Inflorescence an erect secund panicle of 6 to 12 nodding spikelets, the scabrous rays mostly single, erect and appressed, making the panicle appear simple.

Spikelets obovate, 5 to 7 lines long, with 2 or 3 perfect florets and rather large rudiment; empty glumes lance-oblong, narrowed below, obtuse or barely acute, thin, smooth, 5-nerved, 4 to 6 lines long, the first slightly shorter; floral glume lanceolate, acute, minutely hispid, 7-nerved, often with less prominent intermediate nerves toward the base, $4\frac{1}{2}$ to $5\frac{1}{2}$ lines long; palea obovate-oblong, obtuse, minutely hispid, pubescent on the arched keels; stamens 3, with rather short anthers; internode of rachilla straight, nearly smooth, 1 to 2 lines long.

PLATE LXVII; *a*, spikelet with florets nearly in natural position at maturity; *b*, floret opened.

California to Oregon, and extending eastward to Nevada.



No. 68.

PLEUROPOGON CALIFORNICUM Vasey; *Lophochlaena Californica*
Nees. Ann. Nat. Hist. i. 283 (1838).

Plant apparently annual, tufted, with fibrous roots.

Culms erect or somewhat decumbent at base, rather weak, smooth, leafy nearly to the panicle, 2 to 4 feet tall.

Leaves of culm 3 or 4; sheaths smooth, equaling or exceeding the internodes, the lower ones short and membranaceous, the uppermost loose and long, half open at the throat; blade flat or folded, blunt-pointed, smooth or barely rough above, 1 to 3 lines wide, 3 to 12 inches long; ligule very thin, nearly acute, 2 to 3 lines long.

Inflorescence an erect or somewhat flexuous, simple, secund panicle of 6 to 12 spikelets, ascending on pedicels 2 to 3 lines long at intervals of 1 inch or more.

Spikelets linear-oblong, 10- to 20-flowered, 1 inch long or less; empty glumes oblong, obliquely obtuse, thin-membranaceous, smooth, 1-nerved below, the first 1 to 1½ lines long, the second 1 line longer; floral glume lance-oblong, erose or dentate at the membranaceous, obtuse apex, scabrous, strongly 7-nerved, 3 to 4 lines long; awn arising below the apex, 1 to 5 lines long; palea oblong, obtuse, nearly equaling the glume, with flatly infolded margins, an acute wing midway on each keel, and shorter teeth above; stamens 3, with linear anthers; grain reddish brown, oblong, strongly furrowed, 1 line long; internode of rachilla smooth, 1 line long, disarticulating below the rather prominent ring at the base of each floret.

PLATE LXVIII; *a*, empty glumes; *b*, floret; *c*, floral glume, dorsal view.

California to Oregon, in rather low meadow land.



PLEUROPOGON CALIFORNICUM Benth.

W.R. Scholl del.

PLEUROPOGON REFRACTUM Vasey; *Lophochlana refracta* Gray,
Proc. Amer. Acad. viii. 409 (1872).

Plant perennial, tufted, from a strong, creeping rootstock.

Culms erect, simple, smooth, leafy to the panicle, 2 to 4 feet tall.

Leaves of culm 3 or 4; sheaths nearly smooth, striate, open at the throat, equaling or slightly exceeding the long internodes; blade flat or folded, scabrid above, abruptly pointed, 2 to 4 lines wide, lower ones 6 to 10 inches long, uppermost 1 to 2 inches long; ligule truncate, 1 to 2 lines long.

Inflorescence an erect, simple, second panicle of 6 to 10 spikelets pendent on slender, recurved pedicels 1 to 2 lines long at intervals of 1 to 3 inches on the slender, flexuous axis.

Spikelets linear-oblong, 8- to 12-flowered, about 1 inch long; empty glumes lance-oblong, obtuse, or emarginate, often denticulate, thin, smooth, 1-nerved, 2 to 2½ lines long, the second slightly longer; floral glume lance-oblong, erose, or dentate at the rather truncate, membranaceous summit, nearly smooth, prominently 7- to 9-nerved, 3½ to 4 lines long; awn arising at the apex, 2 to 4 lines long; palea linear, emarginate, the margins flatly infolded, with a rather obtuse wing midway on the back of each keel, few if any teeth above, ½ line shorter than the glume; stamens 3; ovary smooth, with 2 stigmas plumose near the ends; grain oblong, dark brown, 2 lines long.

PLATE LXIX; *a*, spikelet; *b*, floret opened; *c*, floral glume, dorsal view.

Oregon and Washington, in cold, damp bogs and along mountain streams. This may be distinguished from the preceding species by its more robust habit, pendent or reflexed spikelets, and blunt wings on the palea.



PLEUROPOGON REFRACTUM Benth.

UNIOLA PALMERI Vasey, Gard. & For. ii. 401 (1889).

Plant perennial, with a strong rootstock, diœcious.

Culms nearly erect, rigid, smooth, 2 to 4 feet tall.

Leaves numerous, distichous, with smooth, close, scarious-margined sheaths open above, and erect or slightly spreading, smooth, involute, sharp-pointed blades 4 to 8 inches long, more numerous and longer above; ligule nearly obsolete, with slight woolly tufts at the angles.

Inflorescence of staminate plant a firm, erect or slightly nodding panicle, 8 to 10 inches long, somewhat secund; rays mostly in twos or threes, erect, unequal, the lower ones 1 to 4 inches long and often subdivided.

Spikelets linear-oblong, compressed, 7- to 9-flowered, 8 to 10 lines long; empty glumes narrowly ovate-lanceolate, acute, smooth, the first 1-nerved, $3\frac{1}{2}$ lines long, the second $\frac{1}{2}$ line longer, obscurely 3-nerved; floral glumes lance-ovate, acute, smooth, 9- to 11-nerved, 4 lines long, the lower 1 or 2 floral glumes and some of the uppermost usually empty; palet linear-oblong, smooth on the 2 keels, $3\frac{1}{2}$ to 4 lines long; stamens 3.

Inflorescence of pistillate plant an oblong panicle included at the base, 4 to 6 inches long, denser than the staminate panicle, rays few and short.

Spikelets turgid, lance-oblong, 7- to 9-flowered, 1 to $1\frac{1}{2}$ inches long; first empty glume linear-lanceolate, acute, smooth, 1-nerved, 4 to 6 lines long; second empty glume ovate, acute, carinate, 3-nerved, 4 to 6 lines long; floral glumes ovate-lanceolate, acute, scarious-margined, 11- to 15-nerved, 6 to 7 lines long, 1 or 2 of the lower floral glumes usually empty; palet lance-ovate, nearly acute, smooth, obscurely 3-nerved on each side of the 2 keels, 4 to 5 lines long; grain linear oblong, with a scar on one side and a shallow channel on the opposite side, brown, about 3 lines long including the persistent, triangular, bifid style; internodes of the rachilla smooth, nearly 1 line long, disarticulating between the flowers. All the glumes and palets in each sex are rather thick and rigid.

PLATE LXX; 1, staminate panicle; 2, pistillate panicle; *a*, staminate spikelet opened; *b*, pistillate spikelet opened, showing the grain from the side next the palet.

Sonora, Mexico. Covering large areas on the banks of the Colorado River near its mouth, growing only where flooded at high tide; probably also along the river into Arizona. The grain is gathered and used by the Indians of the region.



UNIOLA PALMERI Vasey

DECEMBER 1907



POA ARCTICA R. Br. Chlor. Melv. 288 (1823).

Plant perennial from a stoloniferous rootstock, usually purple in the inflorescence.

Culm erect, or sometimes rather weak and geniculate below, smooth, 6 to 15 inches tall.

Leaves of the culm usually 2; sheaths equaling or exceeding the internodes, smooth, striate, usually rather close; blades narrowly linear, 1 to $1\frac{1}{2}$ lines wide, 1 to 2 inches long, hispidulous above or nearly smooth; ligule 1 line long or less.

Inflorescence a loose, ovate or oblong panicle 1 to 3 inches long; rays mostly in pairs at the 5 to 7 nodes, slender, smooth, divided near the ends and bearing 2 to 4 spikelets on pedicels 2 to 3 lines long.

Spikelets obovate, turgid or sometimes spreading and flattened, 3- to 6-flowered, $2\frac{1}{2}$ to 3 lines long; first empty glume ovate, acute or barely obtuse, carinate, thin, smooth, usually purplish throughout, 1-nerved or rarely 3-nerved at the base, 1 to $1\frac{1}{4}$ lines long; second empty glume broader, less acute, convex, smooth, 3-nerved, $1\frac{1}{2}$ lines long; floral glume ovate, obtuse or barely acute, convex, membranaceous above, 5-nerved, the two inner lateral nerves often obscure, pubescent on the lower half, usually villous on the outer lateral nerves and midnerve, $1\frac{1}{2}$ to 2 lines long; web at the base about equaling the glume; palea linear-oblong, slightly bifid at the apex, ciliate on the 2 keels, 1 to $1\frac{1}{4}$ lines long; grain somewhat triangular, $\frac{2}{3}$ line long; 2 lodicules more or less prominent, one usually broad and dentate and the other lanceolate.

PLATE LXXI: *a*, spikelet; *b*, empty glumes and floret partly dissected; *c*, first empty glume; *d*, second empty glume; *e*, floral glume; *f*, pistil nearly mature. 1, from Rocky Mountains in British Columbia; 2, Ungava Bay, Labrador; 3, Fort Conger, Grinnell Land, Lieut. Greeley and D. L. Brainard, typical form; 4, Kelso Mountain, Colorado.

Alaska to Greenland and south in the Rocky Mountains to Colorado. This species is distinct from *P. cenisia* All. in being smaller in size, having smoother rays and smaller, fewer flowered spikelets. The floral glume in *P. cenisia* is pubescent only on the midnerve and outer lateral nerves, while in *P. arctica* it is pubescent throughout below. Probably Fig. 4 should be excluded from this species.



POA ARCTICA R.Br.

W.R. S. 1872. det.

POA ARGENTEA Howell, Bull. Torr. Club, xv. 11 (1888).

Plant perennial, caespitose, having numerous sterile shoots and a stoloniferous rootstock.

Culms erect, or slightly decumbent at the base, smooth, naked above, 6 to 10 inches tall.

Leaves of sterile shoots with loose, scarious sheaths and narrow, loosely involute, erect blades 3 to 4 inches long; leaves of the culm 2 or 3; sheaths striate, smooth, loose, open at the throat, exceeding the short lower internodes; blades flat or folded, blunt-pointed, 1 inch long or less; ligule 1 to 2 lines long, decurrent.

Inflorescence a rather closely flowered, oblong panicle 1 to 2 inches long; rays solitary or in twos at the 5 or 6 nodes, erect or slightly spreading, unequal, $\frac{3}{4}$ inch long or less, spikelet-bearing near the extremities.

Spikelets lance-oblong, 3 to $3\frac{1}{2}$ lines long, 2- or 3-flowered with a rudiment; empty glumes oblong, obtuse, thin, smooth, the first 1-nerved, about 2 lines long, the second 3-nerved at the base and slightly longer than the first, but neither equaling the lower florets; floral glume oblong, coarsely dentate at the thin, membranaceous, truncate apex, smooth, 5-nerved, 2 to $2\frac{1}{2}$ lines long; palea oblong, emarginate, nearly as long as the glume; stamens 3, slightly exserted; internode of rachilla smooth, less than $\frac{1}{2}$ line long.

PLATE LXXII; *a*, spikelet; *b*, floret with glume and palea spread.

Oregon, growing in dense tufts, in shaded but rather dry places in the mountains, at an altitude of 5,000 or 6,000 feet. The membranaceous glumes give the panicle a silvery appearance.



POA ARGENTEA Muhl.

W.P. Scholl, del.



POA BOLANDERI Vasey, Bot. Gaz. vii. 32 (1882).

Plant perennial, loosely tufted.

Culms erect, or slightly geniculate below, somewhat thickened at the base, smooth, leafy to the middle or above, 1 to 2 feet tall.

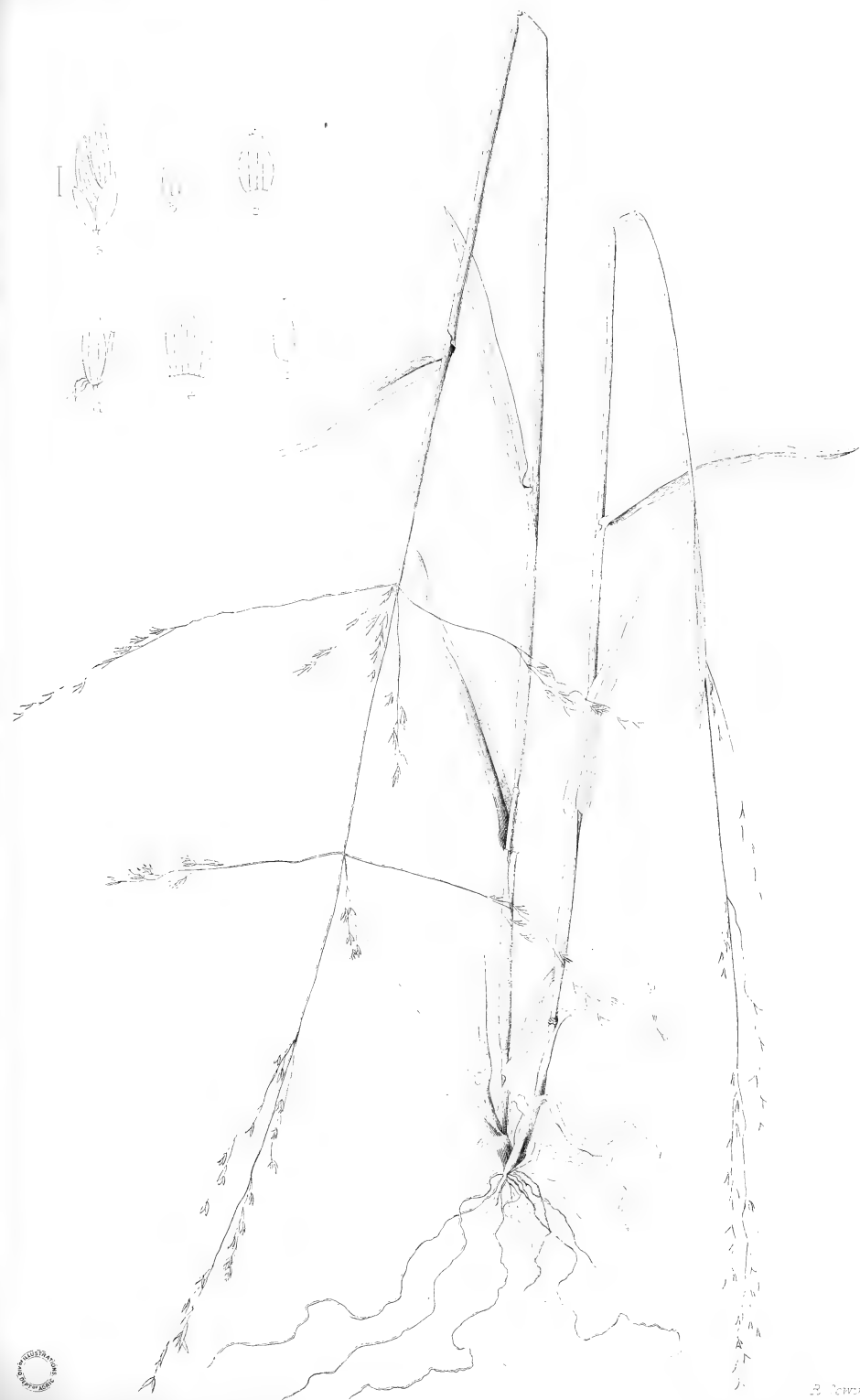
Leaves of the radical tufts thin and lax, smooth, 3 to 6 inches long: leaves of the culm 3 or 4; sheaths smooth, close, closed at the throat, shorter than the rather long internodes; blades flat, rather abruptly pointed, thin, smooth, $1\frac{1}{2}$ to 2 lines wide, 2 to 4 inches long; ligule obtuse, $1\frac{1}{2}$ to 2 lines long.

Inflorescence an erect, slender or at length spreading panicle (perhaps contracted after flowering), 4 to 6 inches long; rays smooth like the axis, 2 to 5 at each of the 4 or 5 distant nodes, erect or at length horizontal, spikelet-bearing towards the extremities, the subdivisions and short pedicels appressed, making the spikelets appear almost sessile on the primary rays at intervals about equaling their own length.

Spikelets 1- to 3-flowered, $1\frac{1}{2}$ to 2 lines long; empty glumes ovate, nearly acute, smooth, the first 1-nerved, 1 line long, the second obscurely 3-nerved and longer than the first but not equaling the lower floret; floral glume ovate-oblong, obtuse or barely acute, too narrow to envelope the mature grain, scarious-margined, nearly smooth except the slight web at the base, 5-nerved, $1\frac{1}{4}$ lines long; palea oblong, obtuse, green, nearly smooth, slightly shorter than the glume; grain lanceolate, slightly flattened, acute at each end, yellow, nearly translucent, 1 line long; internode of rachilla smooth, $\frac{1}{2}$ line long, easily disarticulating between each floret, leaving the empty glumes.

PLATE LXXIII; *a*, plant with panicle contracted; *b*, plant with open panicle; *c*, spikelet; *d*, floral glume, dorsal view; *e*, grain.

California, in the region of Lake Tahoe, and at a few other localities in moist, alkaline soil.



POA BOLANDERI Ktze

B. Bolander



POA FENDLERIANA (Steud.) Vasey; *Eragrostis Fendleriana* Steud. Syn. Gram. 278 (1855).

Plant perennial, densely tufted or in "bunches."

Culms erect, simple, scabrid or nearly smooth, leafy to the middle or above, 1 to 2 feet tall.

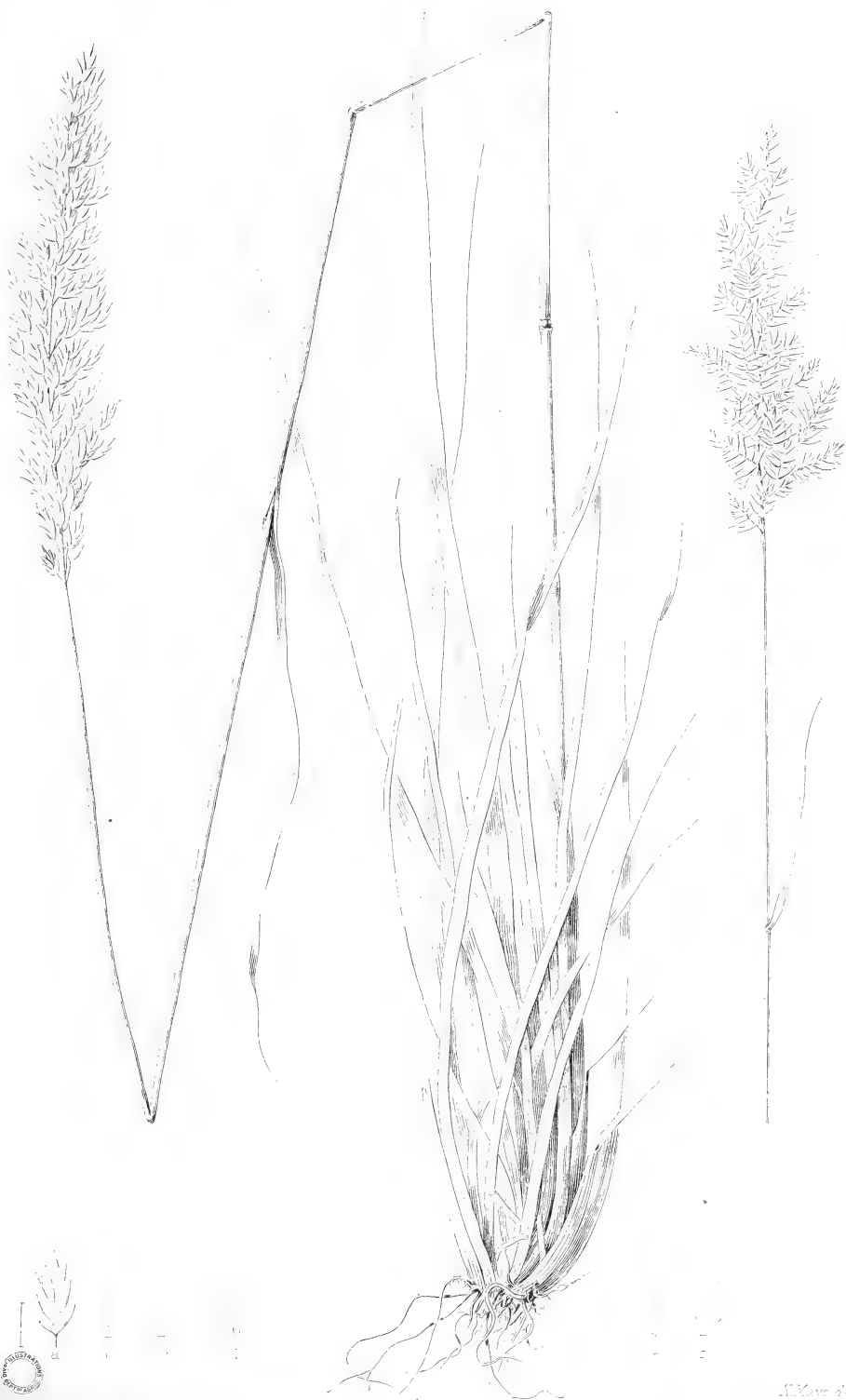
Leaves of radical tufts and sterile shoots very numerous, with smooth scarious sheaths and rather rigid, flat or conduplicate, scabrous blades 1 line wide and 6 to 12 inches long: leaves of the culm 1 to 3; sheaths scabrid above, striate, rather loose, open near the throat, shorter than the internodes; blades 2 to 4 inches long; ligule decurrent, 1 to 2 lines long.

Inflorescence a rather closely flowered, oblong panicle 3 to 6 inches long; rays mostly in twos or threes at the 7- to 10-nodes, minutely scabrid, erect or somewhat spreading, $1\frac{1}{2}$ inches long or less, subdivided and spikelet-bearing to the base or the longer ones naked below.

Spikelets compressed, $3\frac{1}{2}$ to $4\frac{1}{2}$ lines long, 3- to 5-flowered with a rudiment; empty glumes broadly ovate, acute, carinate, minutely scabrid, 1-nerved or the second 3-nerved below, $1\frac{1}{2}$ to 2 lines long, the first slightly smaller, but neither equaling the lower florets; floral glume ovate-oblong, erose or emarginate at the obtuse apex, carinate, hispid on the keel above, and more or less pubescent on the marginal nerves and midnerve below, intermediate nerves less prominent, only the midnerve extending to the apex, 2 to $2\frac{1}{2}$ lines long; palea oblong, emarginate, pubescent on the two keels; stamens 3, nearly sessile in the open, divergent, staminate florets; grain linear, somewhat triangular, with a short, membranaceous wing at the apex, 1 line long; internode of rachilla $\frac{1}{2}$ line long or less.

PLATE LXXIV; *a*, pistillate spikelet; *b*, first empty glume; *c*, second empty glume; *d*, floral glume; *e*, palea not opened, ventral view; *f*, ovary and abortive stamens; *g*, staminate panicle.

Southern California, Arizona, and Nevada. This species was named without description *Sclerochloa Californica* Munro in Benth. Pl. Hartw. 342 (1857), and was described as *Atropis Californica* Munro in Wats. Bot. Cal. ii. 309 (1880). In Vasey, Cat. Grasses of U. S. 81 (1885) it was again changed to *Poa Californica*, and by this name it is probably most widely known. Besides these proper synonyms, specimens have been wrongly named *P. andina* Nutt. and *P. tenuifolia* Nutt. It is apparently completely diocious, and this fact is probably one cause for the multiplicity of names and the confusion regarding the species. The staminate panicle is more open and has fewer spikelets than the pistillate, and the glumes are narrower, thinner, less pubescent, and slightly smaller. The spikelets of the staminate plant are flat, with divergent florets open at maturity; while those of the pistillate plant are more turgid, with merely carinate margins, the florets remaining erect and closed.



POA CALIFORNICA Vasey

POA CONFINIS Vasey sp. nov.

Plant perennial, caespitose or tufted, with numerous sterile shoots from a creeping rootstock.

Culms erect, or slightly decumbent at the base, smooth, slender, leafy to the middle or the shorter ones leafy to the panicle, 4 to 12 inches tall.

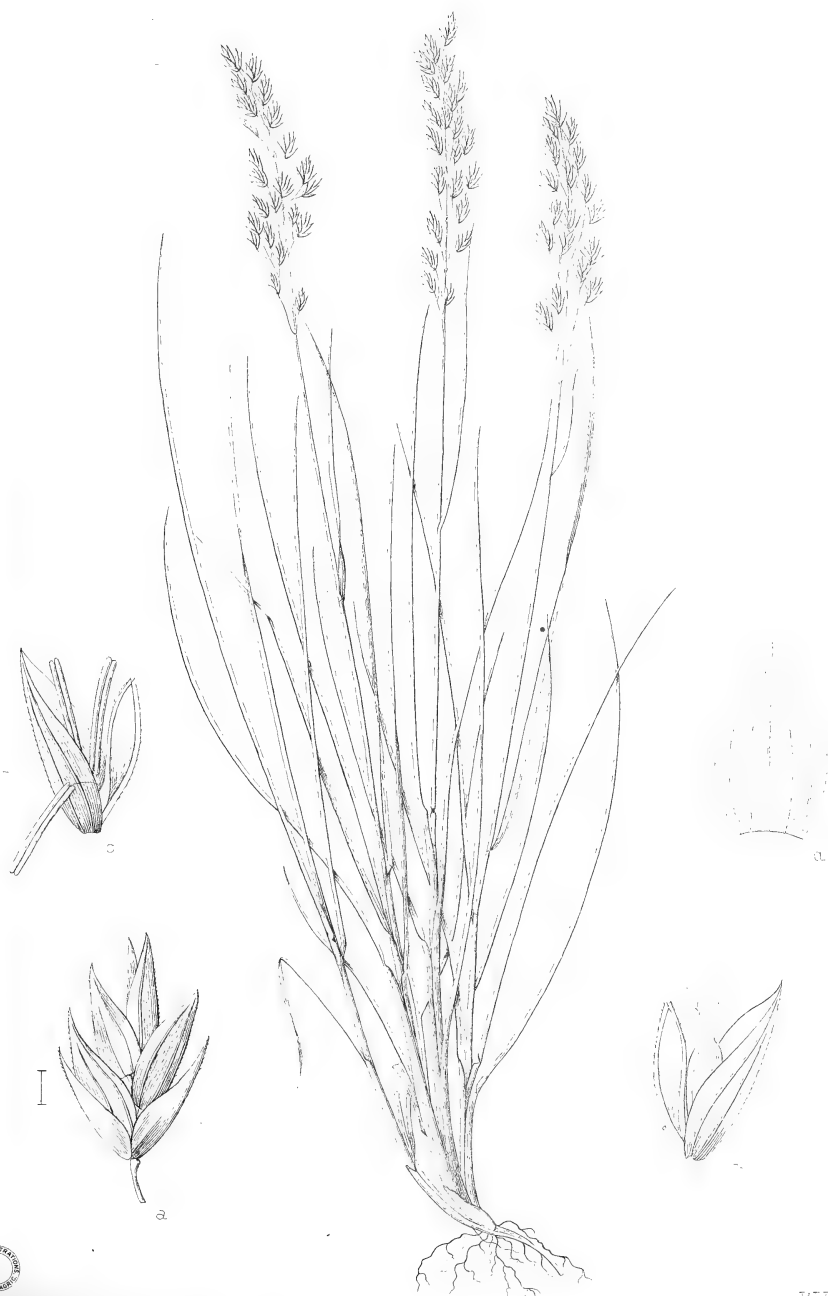
Leaves of sterile shoots numerous, with smooth, striate, scarious-margined sheaths and slender, involute blades 3 to 6 inches long or as long as the culms: leaves of culm 2 or 3; sheaths open above, shorter than the internodes; blades involute, apiculate, 1 to 2 inches long; ligule 1 line long or less or nearly obsolete.

Inflorescence a rather closely flowered, oblong panicle 1 to 2 inches long; rays in twos and threes or solitary at the 3 to 6 nodes, unequal, 1 inch long or less, scabrous, divided, spikelet-bearing near the extremities.

Spikelets slightly compressed, 2 to 3 lines long, 3- to 6-flowered with a rudiment; empty glumes broadly ovate, acute, 1-nerved or obscurely 3-nerved, nearly smooth, 1 to 1½ lines long, the second slightly longer, but neither equaling the lower florets; floral glume broadly ovate, acute, somewhat carinate, slightly pubescent or scabrid in age, rather thick for the genus, not webbed, 5-nerved, about 1½ lines long; palet ovate-oblong, obtuse, arched, twisted when dry, pubescent on the keels; stamens 3, with exserted anthers on very slender filaments; ovary smooth, pear-shaped, with 2 short, feathery stigmas; lodicules ½ line long; grain ovate, furrowed, rough, yellow, 1 line long.

PLATE LXXV; *a*, spikelet; *b*, floret with the glume and palet spread to show the ripened grain; *c*, floret with stamens exserted.

Oregon to Alaska, mostly on the sandy seashore. This species is imperfectly dioecious. Those plants which ripen grain have only abortive stamens, while those with perfect anthers have only abortive pistils. Dr. Thurber in Wats. Bot. Cal. ii. 312 (1880) referred this species to *P. abbreviata* R. Br., a much smaller Arctic species.



POA CONFINIS Vasey.

W.R. Schödel.



POA DOUGLASII Nees. Ann. Nat. Hist. i. 284 (1838).

Plant perennial, densely tufted, with numerous sterile shoots from a long, running, stoloniferous rootstock.

Culms erect, or decumbent at the base, nearly smooth, wiry, leafy to the middle or above, 6 to 15 inches tall.

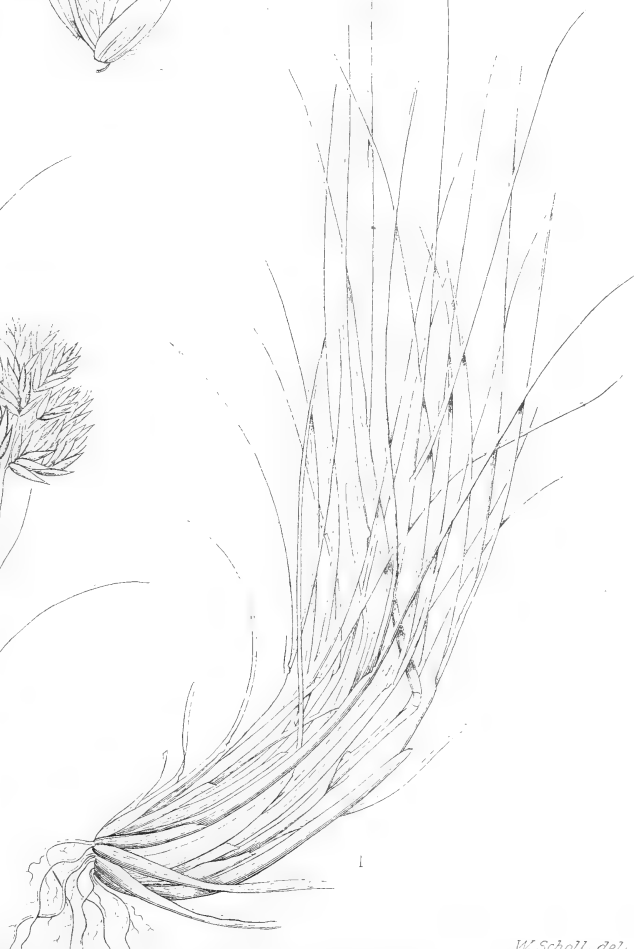
Leaves of sterile shoots with loose, scarious sheaths and closely involute, rather rigid, smooth blades, equaling the culm: leaves of the culm 2 or 3; sheaths scarious-margined, smooth, striate, loose, open above, shorter than the internodes; blades involute like those below and equaling them; ligule decurrent, 1 to 2 lines long.

Inflorescence a closely flowered, almost capitate panicle, 1 to 2 inches long and nearly 1 inch thick, rays in glomerate clusters, $\frac{1}{2}$ inch long or less, subdivided and densely flowered.

Spikelets lanceolate, compressed, 5- to 7-flowered, 3 to 5 lines long; empty glumes ovate, acute, scabrous, hispid on the keels, scarious-margined, 3 nerved, 2 to 3 lines long, shorter than the lower florets; floral glumes lance-ovate, acute, often mucronate, pubescent more or less throughout on the back but more so on the midnerve and marginal nerves, the intermediate nerves less prominent, often ciliate on the margins, $2\frac{1}{2}$ to 3 lines long; palea oblong, 2-toothed at the apex, pubescent on the keels, nearly as long as the glume; stamens 3, with exserted anthers; stigmas 2, feathery to the base

PLATE LXXVI; 1, staminate plant; 2, pistillate plant; *a*, staminate spikelet; *b*, staminate floret; *c*, pistillate spikelet; *d*, pistillate floret opened.

California, mostly near the coast from San Francisco southward. This species is completely dioecious, the staminate spikelets having slightly smaller florets with thinner glumes. It has much the appearance of "beach grass" and was described as *Brizopyrum Douglasii* in Bot. Beechey's Voyage.



POA DOUGLASII, Nees.

W. Scholl, del.



POA GLUMARIS Trin. Mem. Acad. St. Pet. ser. 6. i. 379 (1831).

Plant perennial. with a strong rootstock.

Culm erect, robust, smooth, striate, 1 to 2 feet tall.

Leaves of radical tufts and from sterile shoots numerous, with broad, thick, striate sheaths and flat, smooth, blunt-pointed blades, 2 to 4 lines wide and 3 to 8 inches long: leaves of culm usually but 1 above the base; sheaths loose, smooth, striate, carinate above, half open at the throat, half as long as the culm; blade flat or folded, 2 to 6 inches long; ligule 1 line long or less, crenulate and minutely ciliate.

Inflorescence a closely flowered, contracted, oblong panicle 4 to 8 inches long; rays in threes, fours, or fives, smooth, ascending or slightly spreading, unequal, 2 inches long or less, divided and bearing numerous rather appressed, short-pedicelled spikelets.

Spikelets oblanceolate, about 4 lines long, 3-to 5 flowered, usually with a rudiment; empty glumes nearly equal, lance-ovate, acute, carinate, minutely scabrid, rather thick for the genus, 3-nerved, 3 lines long; floral glume broadly ovate, acute, often denticulate near the apex, minutely scabrid throughout, pubescent on the keel and margins below, 5-to 7-nerved, 2 to 2½ lines long; palet linear oblong, 4-toothed at the apex, pubescent on the 2 keels; grain spindle-shaped, dark reddish brown, 1 line long.

PLATE LXXVII; *a*, part of branch with spikelets in position; *b*, spikelet opened; *c*, empty glumes; *d*, floral glume; *e*, palet opened.

Alaska near the coast, east shore of Hudson Bay, Labrador, and Newfoundland. This species is very plainly marked by the broad, blunt leaves and the large spikelets with thick, scabrous glumes, which give it much the appearance of a *Festuca*. It has not yet been found in California or Nevada, the reference in Bot. Cal. ii. 313 being a mistake for *Festuca confinis* Vasey.



POA GLUMARIS Trin.



POA HOWELLII Vasey & Scribner sp. nov.

Plant perennial, loosely tufted.

Culms erect, nearly smooth, striate, leafy to the middle or above, slightly thickened at the base, 1 to 2 feet tall.

Leaves from the base rather numerous, flat, thin, flexible, 1 to 2 lines wide, 3 to 6 inches long: leaves of the culm 2 or 3; sheaths striate, nearly smooth, half open above, shorter than the long internodes; blades flat or involute near the attenuate points, 2 to 4 inches long; ligule obtuse and lacerate, 2 to 3 lines long.

Inflorescence a rather loose, open panicle 5 to 8 inches long; rays 2 to 5 at each of the 5 or 6 nodes, divergent or spreading, or contracted and erect until near maturity, slightly scabrid, unequal, 3 inches long or less, spikelet-bearing to the middle or below.

Spikelets oblong, 2 to 3 lines long, loosely 3- to 5-flowered with a rudiment; empty glumes ovate, acute, thin, green, slightly hispid on the keels, 1- to 3-nerved, 1 to 1½ lines long, shorter than the lower florets; floral glume ovate, acute, green, except the narrow, membranaceous margins, pubescent throughout, but more so on the keel and marginal nerves, 5-nerved, 1½ lines long; web at base thin, about equaling or shorter than the glume; palea oblong, emarginate, nearly smooth on the green keels, slightly shorter than the glume; grain lanceolate, flattened, semitranslucent, ¾ line long; internode of rachilla pubescent, ½ line long, readily disarticulating.

PLATE LXXVIII; *a*, spikelet; *b*, floret; *c*, mature grain.

California to Oregon in woods and swamps.

NOTE.—The few webby hairs at the base of the floral glume are not figured.



POA HOWELLII

No. 79.

POA KELLOGGII Vasey sp. nov.

Plant perennial, tufted, from a stoloniferous rootstock.

Culms erect, or somewhat decumbent at the base, smooth, leafy nearly to the panicle, 2 to 3 feet tall.

Leaves from the base numerous, with short, scarious sheaths and flat or loosely involute blades 6 to 12 inches long: leaves of the culm usually 3; sheaths nearly smooth, striate, nearly equaling or often exceeding the internodes, the upper one long and extending nearly to the panicle; blades loosely involute, 2 to 4 lines long; ligule, 1 line long or less.

Inflorescence a loose, open, pyramidal panicle; rays scabrous like the axis, in twos or threes at the rather distant 5 or 6 nodes, divergent or horizontal, 3 inches long or less, spikelet-bearing toward the extremities.

Spikelets oblong, compressed, 3 lines long, loosely 2- or 3-flowered with a small rudiment; empty glumes ovate, acute, hispid on the keels, the first 1-nerved, $1\frac{1}{4}$ lines long, the second $\frac{1}{4}$ line longer and 3-nerved; floral glume lance-ovate acute, smooth except the long, thin web at the base, 5-nerved nearly to the apex, the midnerve barely excurrent, about 2 lines long; palet linear-oblong, 2-toothed, nearly smooth on the green keels, $\frac{1}{4}$ line shorter than the glume; stamens 3, slightly exserted; internode of rachilla smooth, nearly 1 line long.

PLATE LXXIX; *a*, spikelet with florets lifted out of the empty glumes; *b*, floret opened.

California. No. 4705 of Bolander's distribution, without locality. This species is evidently somewhat dioecious, but with no apparent difference in the spikelets, unless the glumes in the pistillate florets thicken as they reach maturity.



POA KELLOGGII Vasey

W.R. Scholl del.



POA MACRANTHA Vasey, Bull. Torr. Club, xv. 11 (1885).

Plant perennial, tufted or in small "bunches," usually somewhat glaucous, from a strong rootstock.

Culms erect, or somewhat decumbent at the base, often branched below, smooth, rigid, leafy nearly to the panicle, 1 to 2 feet tall.

Leaves from the base numerous, with loose, smooth sheaths and involute, rigid, smooth, curving or recurved blades 6 to 12 inches long, often somewhat constricted below the less involute corneous points: leaves of the culm 2 to 4; sheaths striate, nearly smooth, scarious-margined, loose and open above, exceeding the internodes; blades involute, pointed, recurved, 2 to 4 inches long; ligule truncate, somewhat crose, decurrent, $\frac{1}{2}$ line long.

Inflorescence a closely flowered, oblong, rather secund panicle, somewhat interrupted below, 2 to 4 inches long; rays in twos or threes, erect, unequal, $\frac{1}{2}$ to 2 inches long, spikelet-bearing nearly to the base.

Spikelets lance-ovate, compressed, 5- to 8-flowered, 6 to 7 lines long; empty glumes lance-ovate, acute, sparsely hispid on the keels, rather thin, 5- to 7-nerved, $3\frac{1}{2}$ to 4 lines long, about equaling the lower florets; floral glume broadly lance-ovate, barely acute, or more often emarginate, scarious-margined above, strigose-pubescent throughout, ciliate on the keel and marginal nerves, $3\frac{1}{2}$ to 4 lines long; palet oblong, emarginate, pubescent on the keels, the broad margins infolded, nearly as long as the glume; stamens 3 with exserted anthers; grain spindle-shaped, roughly wrinkled, golden brown or gray, opaque, 2 lines long; lodicules rather prominent, $\frac{1}{2}$ line long; internode of rachilla thick, pubescent, less than $\frac{1}{2}$ line long.

PLATE LXXX; *a*, spikelet; *b*, floret opened; *c*, floral glume, dorsal view; *d*, grain.

California to Washington, in the sand along the seashore or along the low river banks in the tide-water region. It is dioecious, the staminate panicles being less dense, with more compressed, loosely-flowered spikelets and thinner glumes.



No. 81.

POA NERVOSA (Hook.) Vasey; *Festuca nervosa* Hook. Fl. Bor. Amer. 251 (1840?).

Plant perennial, with a slender, stoloniferous rootstock.

Culms erect, slender, smooth, naked $\frac{1}{3}$ of the way below the panicle, 2 to 3 feet tall.

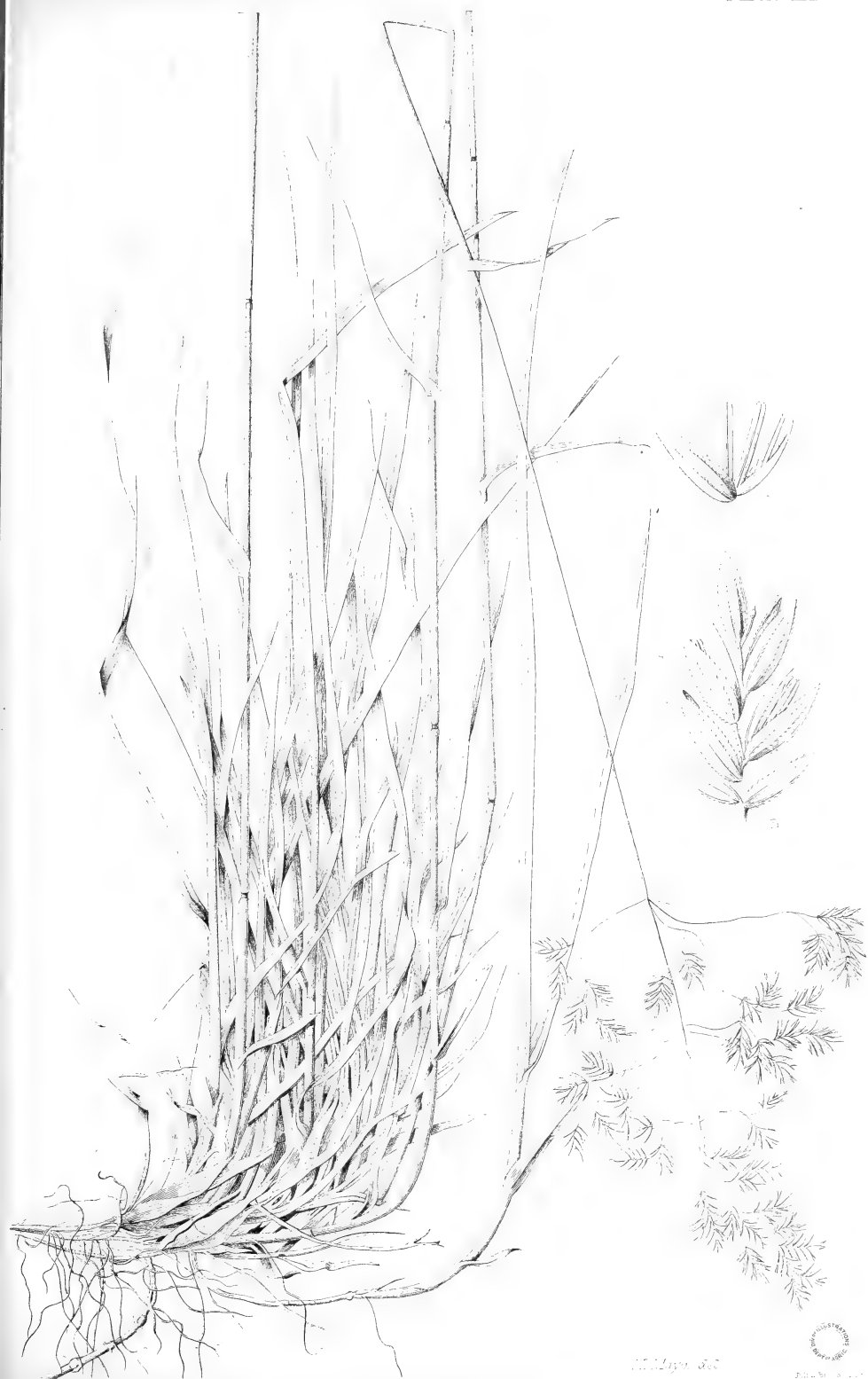
Leaves of sterile shoots numerous, flat or conduplicate, scabrous above, rather thin and flexible, 1 to 2 lines wide, 6 to 12 inches long: leaves of the culm usually 3; sheaths close, smooth, striate, shorter than the long internodes; blades flat, scabrous on the margins, 2 to 4 inches long; ligule obtuse, 1 to 2 lines long.

Inflorescence a loose, open, erect or somewhat flexuous panicle 3 to 5 inches long; rays 2 to 4 at each of the 6 or 7 nodes, slender, slightly scabrous, 2 inches long or less, bearing 2 to 5 spikelets near the extremities.

Spikelets compressed, 4 to 5 lines long, rather loosely 4- to 8-flowered with a small rudiment; empty glumes ovate, acute, carinate, hispid on the keels, $1\frac{1}{4}$ to $1\frac{1}{2}$ lines long, shorter than the lower florets; floral glume lance-ovate, barely acute, scarious margined, scabrous on the nerves or throughout, often villous below but not webbed, 5-nerved, 2 lines long; palea lance-oblong, ciliate on the keels, nearly equaling the glume; grain linear, translucent, 1 line long.

PLATE LXXXI; *a*, spikelet; *b*, floret opened.

Central California to British Columbia and east to Montana in the mountains. It is described in Botany of California as *P. stenantha* Trin., but the specimens do not agree with Trinius's description. It is a very common grass in open pine woods, and is considered valuable for stock-grazing.



POA HYPERBOREA L.

Willd. Sp. Pl.

Flora Sib. 2. 1858



POA PULCHELLA var. **MAJOR** Vasey var. nov.

Plant perennial, caespitose at the base, with a branching rootstock.

Culms erect, or decumbent below and somewhat geniculate, slender, smooth, 1 foot tall.

Leaves from the base numerous, with rather broad, scarious sheaths and flat or convolute, smooth blades 1 line or less wide, 2 to 4 inches long: leaves of the culm usually 2, with close, striate, smooth sheaths shorter than the internodes, and erect, flat blades 1 to 2 inches long; ligule attenuate-pointed, 2 to 3 lines long.

Inflorescence a loose, open panicle 2 to 4 inches long; rays slender, nearly smooth, flexuous, mostly in pairs at the 4 or 5 nodes, spreading or horizontal, $2\frac{1}{2}$ inches long or less, bearing 1 to 3 spikelets near the extremities.

Spikelets oblong, compressed, 3 to 4 lines long, 3- to 5-flowered with a rudiment; empty glumes ovate, acute or obtuse, smooth, the first 1-nerved, 1 to $1\frac{1}{2}$ lines long, the second 3-nerved and slightly longer than the first, but both shorter than the lower florets; floral glume lance-ovate, obtuse and erose or nearly acute at the scarious apex, minutely scabrid on the keel and nerves or throughout, not webbed, 5-nerved, 2 lines long; palea oblong, bidentate or obtuse and erose, pubescent on the keels, nearly as long as the glume.

PLATE LXXXII; *a*, spikelet; *b*, floret opened.

Southern Oregon in the same locality as the species proper, which differs from the variety in being smaller, except in the spikelets, and in the short, filiform radical leaves, obtuse ligules, and more obtuse and coarsely erose glumes. Species described in Bot. Gaz. vii. 32.



POA PULCHELLA Z. & MAJER U.

POA PURPURASCENS Vasey, Bot. Gaz. vi. 297 (1881).

Plant perennial, tufted or caespitose, from a strong rootstock.

Culms erect, wiry, smooth or slightly scabrid, usually naked above the middle, 10 to 15 inches tall.

Leaves of sterile shoots numerous, with short, narrow sheaths and closely involute, smooth or scabrid, erect blades less than 1 line wide and 4 to 6 inches long; leaves of the culm 2 or 3; sheaths striate, smooth, the lower ones short but exceeding the internodes, the upper one extending half the length of the culm; blades wider and less involute than those of the base or often flat, 1 to 2 inches long; ligule obtuse, 1 line long or less or often nearly obsolete.

Inflorescence a rather closely flowered, oblong panicle 1 to 3 inches long; rays hispid, 2 to 4 at each of the 5 to 7 nodes, 1 inch long or less, nearly erect or somewhat spreading, subdivided and spikelet-bearing near the extremities or above the middle.

Spikelets rather turgid, 3- to 5-flowered, $2\frac{1}{2}$ to 3 lines long; empty glumes ovate, acute or subobtuse, smooth, 1-nerved or obscurely 3-nerved, $1\frac{1}{2}$ to 2 lines long, shorter than the lower florets; floral glume lance-ovate, acute or obtuse, sometimes slightly cuspidate, minutely scabrid throughout, hispid-ciliate on the keel, narrowly scarious-margined above, 5-nerved, $2\frac{1}{2}$ to 3 lines long; palea oblong, obtuse, ciliate on the 2 keels, 2 lines long; grain oblong, greenish yellow, nearly opaque, 1 line long; internode of rachilla slender, nearly smooth, about $\frac{1}{2}$ line long, the upper one bearing a minute rudiment.

PLATE LXXXIII; *a*, spikelet; *b*, floret.

Central California to British Columbia and eastward to Colorado. It is somewhat variable, as any *Poa* must be with such a range. The first description was based on a series of specimens which were uniformly purple in the inflorescence, but other forms differing only in this one respect cannot be excluded.



POTAMOGETON AMPLIFOLIUS (L.) Steud.

POA THURBERIANA (O. Ktze.) Vasey; *Panicularia Thurberiana* O. Ktze.
Rev. Gen. Pl. ii. 783 (1891).

Plant perennial, pale green throughout, tufted; roots fibrous.

Culms erect, clothed at the base with scarious sheaths, leafy to the panicle, 2 to 3 feet tall.

Leaves from the base numerous, with smooth, striate sheaths 3 to 5 inches long, and slender, scabrid blades, conduplicate or loosely involute, 1 line wide and 4 to 12 inches long: leaves of the culm usually 4; sheaths striate, smooth, close, open above, exceeding the long internodes; blades 3 to 6 inches long; ligule subacute, wider than the blade, decurrent, 2 lines long.

Inflorescence an erect, narrow, contracted panicle 6 to 12 inches long; rays mostly in twos or threes at the 10 to 15 nodes, scabrid like the axis, erect, spikelet-bearing nearly to the base, or the longer ones naked below.

Spikelets small, $1\frac{1}{2}$ to 2 lines long, with one perfect floret and a rather large rudiment, or 2 florets and a very small rudiment; empty glumes ovate, subacute, thin, nearly smooth, the first 1-nerved, 1 line long, the second 3-nerved below and $\frac{1}{4}$ line longer than the first, each about $\frac{2}{3}$ as long as the adjacent florets; floral glume broadly lance-oblong, minutely crose at the obtuse or rounded, membranaceous apex, nearly smooth, 5-nerved, $1\frac{1}{2}$ lines long; palet puberulent on the 2 keels, about equaling the glumes; stamens 3, with short filaments and included anthers; stigmas small, sessile.

PLATE LXXXIV; *a*, spikelet with 2 perfect flowers and a rudiment; *b*, floret and rudiment of 1-flowered spikelet; *c*, first empty glume; *d*, second empty glume; *e*, floral glume; *f*, palet inclosing the ovary, ventral view.

California, in wet meadows in the valleys of the Sierra Nevada, California. Described in Bot. Cal. ii. 310 as *Atropis pauciflora*, and changed by Otto Kuntze, Rev. Gen. Pl. ii. 783, to *Panicularia Thurberiana*. It is plain to me, however, that this and some other species which are placed in *Atropis* by Prof. Thurber in Bot. Cal., are true *Poa* and should be restored to that genus. Dr. Kuntze's name was given on the supposition that it was an *Atropis*, which he thinks is properly called *Panicularia*; and as the specific name had already been appropriated in that genus, it was necessary to adopt another. As the name *pauciflora* has been employed for a *Poa* by Reimer and Schultes, it would seem that Kuntze's name should be adopted for the species under *Poa*.



POA THURBERIANA (O.K.) Nash.



POA UNILATERALIS Scribner sp. nov.

Plant perennial, tufted or in small bunches, from a strong rootstock.

Culms erect, or decumbent at the base, smooth, leafy nearly to the panicle, 10 to 20 inches tall, thickened or almost bulbous.

Leaves from the base numerous, with loose, scarious sheaths and flat, conduplicate or involute blades, slender, thin, flexible, 2 to 5 inches long, less than 1 line wide: leaves of the culm 2 or 3; sheaths nearly smooth, striate, rather loose, usually open at the throat, shorter than the internodes; blades 1 to 3 inches long, ligule attenuate, acute, 2 to 3 lines long.

Inflorescence a densely flowered, secund, spike-like panicle 1 to 3 inches long, $\frac{1}{3}$ inch thick; rays scabrous, mostly in twos or threes at the 8 to 10 nodes, 1 inch long or less, erect, crowded with appressed spikelets.

Spikelets oblong, compressed, 5 lines long, 5- to 7-flowered with a small rudiment; empty glumes ovate, acute, carinate, hispid on the keel, minutely serrulate on the scarious margins, 1- to 3-nerved, $1\frac{1}{2}$ to 3 lines long, shorter than the lower florets; floral glume ovate, acute, hispid on the keels, pubescent at the base, not webbed, 2 lines long; palea linear, emarginate, pubescent on the keels, nearly equaling the glume; stamens 3 with exserted anthers, grain linear, reddish brown, semitranslucent, 1 line long; lodicules less than $\frac{1}{2}$ line long; internode of rachilla thick, pubescent, $\frac{1}{2}$ line long.

PLATE LXXXV; *a*, pistillate spikelet; *b*, staminate floret.

California, from San Francisco southward along the coast. The species is imperfectly dioecious, with little difference between the sexes, except that the staminate plants have flatter and more open spikelets with thinner glumes. It may be readily distinguished from *P. macrantha* and *P. Douglasii* by its narrow panicle of smaller spikelets and by the slender, flexible leaves. The spike is often more or less one-sided; hence the specific name.



POA UNILATERALIS Scribn.

COLPODIUM PENDULINUM (Læst.) Griseb. in Ledeb. Fl. Ross. iv. 386 (1853); *Glyceria pendulina* Læst. in Wahlenb. Fl. Suec. ii. 1088 (1824-26).

Plant perennial, somewhat tufted, from a creeping rootstock.

Culms erect or slightly geniculate, clothed throughout with the numerous overlapping sheaths.

Leaves of culm 6 to 10, with close, smooth, striate, usually overlapping sheaths; flat, smooth, striate, rather thick and rigid, slightly spreading blades $1\frac{1}{2}$ to 2 lines wide, 4 to 8 inches long; ligule membranaceous, truncate, $1\frac{1}{2}$ lines long or less.

Inflorescence a pyramidal panicle 4 to 6 inches long; rays mostly in pairs, often divided so as to appear like fours, at the 6 to 8 nodes of the slender, smooth, common axis, spreading or usually deflexed at maturity, smooth, flexuous, divided beyond the middle and bearing few spikelets often pendulous on the short pedicels.

Spikelets oblong, loosely 5- to 8-flowered, about 3 lines long; first empty glume oblanceolate, barely acute, smooth, 1-nerved, $1\frac{1}{4}$ lines long; second empty glume broadly rhombic-ovate, smooth, obscurely 3-nerved, $1\frac{1}{2}$ lines long; floral glume obovate, erose at the thin, membranaceous apex, smooth except a few hairs at the base, obscurely 3-nerved, 1 to $1\frac{1}{4}$ lines long and about as wide; palet obovate, erose, 2-lobed above, smooth on the 2 rather obscure nerves, slightly hairy at the base, less than 1 line long; grain linear, reddish brown, 1 line long; lodicules present, rather small and obscure; internodes of the zigzag rachis smooth, about $\frac{1}{2}$ line long.

PLATE LXXXVI; *a*, spikelet enlarged; *b*, floral glume; *c*, palet opened; *d*, pistil and lodicules.

Arctic America, Siberia, and Lapland.



DUPONTIA FISHERI R. Br. Chlor. Melv. 291 (1823).

Plant perennial, tufted, from a strong, running rootstock with numerous sterile shoots.

Culms erect, simple, robust, 6 to 10 inches tall.

Leaves of radical tufts and sterile shoots numerous, flat or folded, with attenuate points, smooth, two-thirds as long as the culm: leaves of the culm 2 or 3; sheaths striate, smooth, loose, half open above, exceeding the internodes; blades 2 lines wide or less, upper one shorter, all about equaling the radical leaves; ligule truncate erose, less than 1 line long.

Inflorescence an erect, oblong, rather closely flowered panicle 2 to 3 inches long; rays in twos, threes, or fours at the 5 to 7 nodes of the slightly flexuous, thick, smooth, common axis, erect or almost appressed, smooth, 1 inch or less long, spikelet-bearing nearly to the base.

Spikelets spindle-shaped, mostly 2-flowered, 3 lines long; empty glumes exceeding the florets, ovate, with thin, golden, attenuate points, smooth, the first 1-nerved, nearly 3 lines long, the second obscurely 3-nerved below and slightly longer; floral glume broadly lance-oblong, obtuse, often somewhat erose above, thin, more or less pubescent on the back below and especially on the rather prominent midnerve, 2 lateral nerves obscure, 2 to 2½ lines long; palea linear-oblong, bidentate at the apex, nearly smooth on the 2 keels; lodicules 2 or 3, somewhat dentate or lacerate, ½ line long.

PLATE LXXXVII; *a*, spikelet opened to show position of florets; *b*, empty glumes; *c*, floret; *d*, floral glume, dorsal view; *e*, palea.

Alaska to Greenland, readily distinguished from other species of the genus by the obtuse, pubescent floral glumes and denser panicle. The specific name was spelled in the original publication *Fisheri*. Subsequent authors have spelled it *Fischeri*; hence the mistake on the plate.



DUPONTIA PSILOSANTHA var. FLAVESCENS (Hook. & Arn.) Griseb.
in Ledeb. Fl. Ross. iv. 386 (1853); *D. Fisheri* var. *flavescens* Hook. & Arn. Bot.
Beech. 132 (1841).

Plant perennial, scarcely tufted, from a creeping rootstock.

Culms erect, simple, terete, smooth, rather robust, 12 to 18 inches tall.

Leaves of culm 2 or 3; sheaths rather loose, smooth, open above, equaling or exceeding the internodes; blades flat, or involute toward the points, smooth, 2 to 3 inches long; ligule thin, membranaceous, truncate-obtuse, erose or lacerate, 1 line long.

Inflorescence a loose, pyramidal, erect panicle 2 to 4 inches long; rays divergent, horizontal or deflexed, in twos or threes at the 4 or 5 rather distant nodes of the smooth, rigid, common axis, smooth, 2 inches long or less, bearing 3 to 6 pedicellate spikelets mostly near the extremities.

Spikelets spindle-shaped, turgid, 3 lines long, 1-flowered, with a narrow, linear rudiment; empty glumes ovate, acute, involute toward the thin, golden apices, making them appear acuminate and attenuate, smooth, purplish below, the first 1-nerved, $2\frac{3}{4}$ lines long, the second 3-nerved below and $\frac{1}{4}$ line longer; floral glume ovate-lanceolate, acute, smooth, 3-nerved, $2\frac{1}{2}$ lines long; palet broadly lance-oblong, emarginate, nearly smooth on the 2 keels; grain elliptical; lodicules 1 or 2, rather prominent, broad and dentate above.

PLATE LXXXVIII; *a*, spikelet slightly opened; *b*, spikelet slightly dissected, showing the linear rudiment at the base of the floret; *c*, first empty glume; *d*, second empty glume; *e*, floral glume; *f*, palet open; *g*, pistil and lodicules.

In the Botany of Beechey's Voyage a 2-flowered form is mentioned, which is not represented in the National Herbarium. Readily distinguished by the golden yellow empty glumes and the smooth, acute floral glume. Alaska and perhaps elsewhere in Arctic America.



GLYCERIA PAUCIFLORA Presl. Rel. Hænk. i. 257 (1830).

Plant perennial, often purple in the inflorescence, with a stoloniferous rootstock.

Culms erect, robust, smooth, leafy nearly to the panicle, $1\frac{1}{2}$ to 3 feet tall.

Leaves of the culm 3 or 4; sheaths striate, nearly smooth, loose, open, usually exceeding the internodes; blades flat, lanceolate, somewhat scabrid on both sides, 3 to 6 lines wide, 3 to 6 inches long; ligule rounded or more often lacerate, 2 to 3 lines long.

Inflorescence a somewhat contracted and flexuous or at length loose and open panicle 5 to 8 inches long; rays hispid, 2 to 5 together (usually in pairs) at the 6 to 8 nodes, slightly spreading or nearly horizontal, 4 inches long or less, divided and spikelet-bearing from the middle.

Spikelets linear, 5- to 7-flowered, 2 to 3 lines long; empty glumes less than half the length of the adjacent florets, the first ovate, denticulate near the subacute apex, smooth, 1-nerved, $\frac{1}{2}$ line long, the second erose at the rounded apex, 3-nerved, nearly 1 line long; floral glume broadly oblong, erose at the rounded, scarious apex, hispidulous on the keel, prominently 5-nerved, 1 to $1\frac{1}{4}$ lines long; palet oblong, emarginate, slightly pubescent on the 2 keels, nearly equaling the glume; stamens 3, the oblong anthers $\frac{1}{2}$ line long, scarcely exserted; stigmas feathered nearly to the base; grain yellow, subtranslucent, smooth, about $\frac{1}{2}$ line long.

PLATE LXXXIX; *a*, spikelet; *b*, floret opened; *c*, floral glume.

California to Alaska and eastward to Colorado in the mountains, near water or in the borders of ponds.



GLYCERIA PAUCIFLORA B.

ATROPIS LEMMONI Vasey; *Poa Lemmoni* Vasey, Bot. Gaz. iii. 13 (1878).

Plant perennial, tufted, light green or glaucous; roots fibrous.

Culms erect, slender, smooth, wiry, 1 to 1½ feet tall.

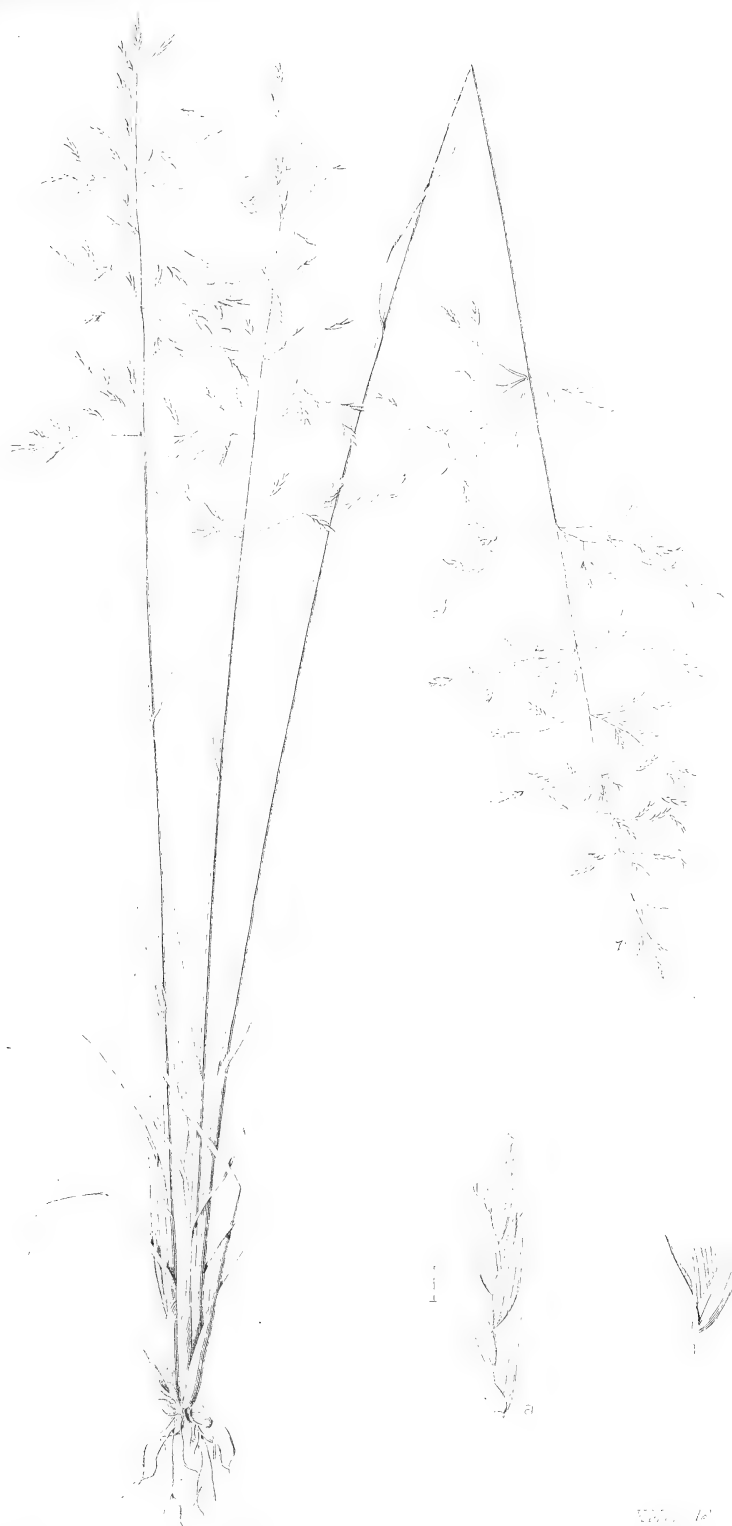
Leaves from the base numerous, with short sheaths and closely involute, pungently-pointed blades, scabrid on the margins, 2 to 5 inches long: leaves of the culm usually 3; sheaths nearly smooth, half open at the throat, the lower ones equaling or slightly exceeding the short internodes, the upper one longer, often extending to the panicle; blades involute, 1 to 3 inches long; ligule obtuse or subacute, about 1 line long.

Inflorescence an erect, loosely flowered, contracted and narrow or sometimes open panicle 3 to 5 inches long; rays 2 to 5 at each of the 6 to 8 nodes, slightly scabrous, erect or sometimes spreading or horizontal, unequal, 2 inches long or less, the longer ones divided and spikelet-bearing beyond the middle.

Spikelets linear-oblong, 3- to 7-flowered, 2 to 3 lines long; empty glumes ovate, acute, slightly hispid on the keels, thin, the first 1-nerved, $\frac{2}{3}$ line long, the second 3-nerved and $\frac{1}{2}$ line longer, each extending about half the length of the adjacent florets; floral glume oblong-lanceolate, irregularly crenulate or minutely denticulate near the subacute apex, nearly smooth, 5-nerved, 1½ lines long; palea oblong, obtuse or slightly 2-toothed, minutely hispid on the keels, about equaling the glume; stamens 3; lodicules 2, inconspicuous; internode of rachilla slightly puberulent, $\frac{1}{2}$ line long, the upper joint bearing a small rudiment.

PLATE XC; *a*, spikelet; *b*, floret; *c*, floral glume, dorsal view.

California to British Columbia in the mountains. This species was first described as *Poa Lemmoni* Vasey, in Bot. Gaz. iii. 13. It is a good *Atropis* if *Atropis* is to be held as a separate genus; if not, it becomes a *Glyceria* rather than a *Poa*. If *Puccinellia* takes precedence of *Atropis*, as it does according to Dr. Watson, then our plant will be *Puccinellia Lemmoni*.



ATROPIS LEMMONI Gray.



FESTUCA MICROSTACHYS Nutt. Pl. Gamb. 187 (1848).

Plant annual or biennial, tufted, sometimes with a rather weak rootstock.

Culms erect or spreading, often geniculate at the lower nodes, smooth, slender, 10 to 20 inches tall.

Leaves of the culm usually 3; sheaths smooth or pubescent, close, half open at the throat, usually shorter than the rather short lower nodes; blades involute, narrow, 2 or 3 inches long; ligule wider than the blade, but very short.

Inflorescence simple and racemose or usually branched, especially below, secund by the twisting of the angular axis which is 2 to 5 inches long; rays single, spreading or sometimes deflexed, channeled above, crowded to the base on the lower side with spikelets on short, clavate pedicels.

Spikelets 3- to 6-flowered, $3\frac{1}{2}$ to 5 lines long; empty glumes narrowly lanceolate, acute, smooth or rarely thinly pubescent, the first 1-nerved, 2 to $2\frac{1}{2}$ lines long, the second 3-nerved and $\frac{1}{2}$ to 1 line longer than the first, more than half the length of the adjacent floret; floral glume lance-ovate, acute, roughly pubescent or nearly smooth, obscurely 5-nerved, about 3 lines long, terminating in a hispid awn, 3 to 5 lines long; palea lance-oblong, with hispid keels terminating in two setose teeth which project nearly a line beyond the glume at maturity; stamens seldom more than one fully developed and this with a small anther not exerted; grain spindle-shaped, channeled on one side, dark purple, $2\frac{1}{2}$ lines long, falling with the adherent glume and palea; internode of rachilla $\frac{1}{2}$ line long, readily disarticulating between the florets, the upper joint bearing a small rudiment.

PLATE XCI; 1 and 2, ordinary forms of the species; 3, dwarf form; *a*, spikelet; *b*, floret, ventral view; *c*, floral glume unrolled, dorsal view; *d*, palea; *e* and *f*, spikelet and enlarged view of floral glume of dwarf form.

Southern California to Washington and eastward to Arizona and Utah. Very variable, especially in the inflorescence and pubescence.



FESTUCA MICROSTACHYS Nutt.

Holm, del.



FESTUCA SUBULATA Bong. Veg. Sitch. 173 (1831).

Plant perennial, tufted, with numerous radical leaves and sterile shoots.

Culms erect, simple, nearly smooth, 2 to 3 feet tall.

Leaves of radical tufts and of sterile shoots with rather thin, chartaceous, smooth sheaths and involute, scabrous blades 6 to 12 inches long, usually deciduous to the sheath: leaves of the culm usually but 1 above the base; sheath striate, nearly smooth, close, open at the throat; blade flat or involute, 3 to 5 inches long; ligule nearly obsolete.

Inflorescence a loose, open, flexuous panicle 4 to 7 inches long; rays mostly in twos at the 5 to 7 nodes of the rachis, scabrous, flexuous, usually contracted above, somewhat spreading or reflexed in age below, spikelet-bearing mostly beyond the middle.

Spikelets rather turgid, 3- to 5-flowered, 6 to 7 lines long; first empty glume narrowly ovate, barely acute, hispid on the keel, 3 lines long; second empty glume broadly lanceolate, acute, convex, hispid on the keel, 3-nerved, 4 lines long; floral glume lance-ovate, acute, the points involute-subulate, convex, scabrous, 5-nerved, 5 to 6 lines long; palea lance-linear, bifid at the apex, minutely pubescent on the keels, $\frac{1}{2}$ line shorter than the glume.

PLATE XCII; *a*, spikelet spread somewhat; *b*, first empty glume; *c*, second empty glume; *d*, floral glume; *e*, palea not opened, young stamens showing below.

It may be distinguished from *Festuca scabrella* Torr. by its larger and looser panicle, and larger spikelets with subulate pointed glumes. This description is based on specimens from Alaska, which, however, do not wholly agree with the description of Bongard.



FESTUCA SUBULATA *Bong.*

FESTUCA VIRIDULA Vasey sp. nov.

Plant perennial, tufted, with coarse, woolly roots.

Culms erect, slender, smooth, thickened at the base, 2 to 4 feet tall.

Leaves from the base numerous, closely involute, almost filiform, reaching nearly to the panicle: leaves of the culm usually 3; sheaths striate, smooth, half open above, shorter than the long internodes; blades mostly flat, scabrid above, 1 to 2 lines wide, 3 to 6 inches long; ligule almost obsolete.

Inflorescence a loose, open, erect or slightly nodding panicle, 4 to 6 inches long; rays mostly in twos below and single above, at the 4 to 6 nodes, hispid like the axis, angular or flattened, 3 inches long or less, the longer ones sometimes subdivided and bearing 2 to 4 spikelets near the extremities, the upper ones bearing but 1 spikelet, or rarely simple throughout.

Spikelets compressed, 3- to 6-flowered, 5 to 6 lines long; first empty glume ovate, acute, 1-nerved, $1\frac{1}{4}$ lines long; second empty glume broadly lanceolate, subacute, broadly scarious-margined, 3-nerved below, 2 lines long; floral glume lance-oblong, denticulate below the acute or more often mucronate apex, minutely puberulent, 5-nerved, 3 to $3\frac{1}{2}$ lines long; palea oblong, obtuse, minutely ciliate on the keels above, about equaling the glume; internode of rachilla $\frac{2}{3}$ line long.

PLATE XCIII; *a*, spikelet; *b*, first empty glume; *c*, second empty glume; *d*, floral glume, dorsal view; *e*, palea, ventral view, not opened; *f*, panicle of one of Bolander's specimens.

California. Dr. Thurber's description in Wats. Bot. Cal. ii. 318 was erroneous, in naming this grass *Festuca gracillima* after the Antarctic species of Hooker, as I have verified by examination of original specimens in the Kew herbarium. I have therefore named it *F. viridula*.



R. Coving.

FESTUCA VIRIDULA Vasey.

BROMUS ORCUTTIANUS Vasey, Bot. Gaz. x. 223 (1885).

Plant perennial, loosely tufted.

Culms erect, thickened at the base, finely pubescent or nearly smooth, leafy to the middle or above, 2 to 4 feet tall.

Leaves from the base numerous, with very short-sheaths and flat blades, 4 to 8 inches long: leaves of the culm 3 or 4; sheaths close, half open at the throat, striate, pubescent or nearly smooth, shorter than the long internodes; blades flat, smooth or the upper ones scabrous, 2 to 4 lines wide, 3 to 6 inches long; ligule rather thick, less than 1 line long.

Inflorescence an erect panicle 4 to 6 inches long; rays 2 to 4 at each of the 5 or 6 nodes, erect or slightly spreading, or rigidly horizontal, and even deflexed at maturity, unequal, 3 inches long or less, slightly scabrid, bearing appressed spikelets on pedicels mostly shorter than themselves.

Spikelets 1 to 1½ inches long, with 3 to 6 florets and an awned rudiment, erect and imbricated, or at length loose and divergent; first empty glume narrowly ovate, acute, carinate, hispid on the keel, 1-nerved or obscurely 3-nerved, 2½ to 3½ lines long; second empty glume lance-oblong, acute, or often mucronate, slightly hispid or thinly pubescent, prominently 3-nerved, 3 to 4 lines long; floral glume lance-oblong, subacute or rounded at the narrow apex, hispidulous, 5- to 7-nerved, 4½ to 6 lines long; awn arising at the apex or just below, hispid, 2 to 4 lines long; palea lanceolate, rounded or nearly acute at the apex, ciliate on the keels, half a line shorter than the glume; stamens 3, with yellow anthers 2 lines long; ovary pubescent; grain linear, with a shallow channel on one side, yellow or brown, semitranslucent, 4 to 5 lines long, including the tuft of white hairs at the rounded apex; lodicules 2, ½ line long; internode of rachilla slender, pubescent, 1 to 1½ lines long.

PLATE XCIV; 1, plant at flowering time; 2, panicle at maturity; *a*, spikelet; *b*, empty glumes; *c*, floral glume, side view and dorsal view; *d*, palea; *e*, lodicules and grain.

Southern California to Washington. The specimens from different regions vary considerably in the pubescence and in the rigidity of the panicle.



Brom. 28.

BROMUS ORCUTTIANUS Vasey.

BROMUS SUKSDORFII Vasey, Bot. Gaz. x. 223 (1885).

Plant perennial, in tufts or small bunches, with matted, almost woody base and coarse roots.

Culms erect, striate, nearly smooth, naked $\frac{1}{3}$ way below the panicle, 2 feet tall.

Leaves of the culm 4 to 6; sheaths striate, smooth, half open at the throat, usually exceeding the internodes; blades erect, flat, auriculate at the base, 2 to 4 lines wide, 3 to 6 inches long, the middle ones longest; ligule obtuse, crenulate, $1\frac{1}{2}$ lines long or less.

Inflorescence a close, strict, erect panicle 3 to 5 inches long; rays 2 to 4 at each of the 4 or 5 nodes, erect, unequal, 2 inches long or less, bearing appressed, short-pedicelled spikelets.

Spikelets narrowly lanceolate, acute, 4- to 6-flowered, $\frac{3}{4}$ to 1 inch long, the florets erect and closely imbricated; empty glumes oblong-ovate, obtuse, smooth, or slightly pubescent on the nerves, the first 1-nerved or indistinctly 3-nerved, 4 to 5 lines long, the second 1 line longer and 5-nerved; floral glume lance-ovate, acute or sub-obtuse, finely pubescent, 7-nerved, 6 to 7 lines long, with a straight awn 2 lines long at the apex; palet oblanceolate, rounded at the apex, sparsely ciliate on the keels, 1 line shorter than the glume; grain oblong, with broad, shallow groove on one side, acute at the base, with a tuft of hairs at the rounded apex, reddish yellow, semitranslucent, 4 lines long; internode of rachilla smooth, $1\frac{1}{2}$ lines long.

PLATE XCV; *a*, spikelet; *b*, first empty glume; *c*, second empty glume; *d*, floral glume; *e*, palet not opened, ventral view; *f*, grain.

Oregon and Washington in the dry mountains at 5,000 to 7,000 feet altitude. The species is well marked by the short, close panicle.



BROMUS SUKSDORFII Vasey

R. Conning.

AGROPYRUM DIVERGENS Nees. in Steud. Syn. Gram. 347 (1855).

Plant perennial, somewhat tufted, usually glaucous.

Culms erect, thickened at the base, slender, smooth, 2 to 3 feet tall.

Leaves of the sterile shoots, with long, close sheaths and involute blades 4 to 6 inches long; leaves of the culm 2 or 3; sheaths close, truncate at the throat and nearly closed, shorter than the upper internodes; blades involute, rather rigid, pungently pointed, slightly auricled, smooth, 1 to 2 lines wide, 4 to 6 inches long; ligule almost obsolete.

Inflorescence a linear, erect or slightly nodding, loose spike, with 1 sessile appressed spikelet at each of the 6 to 12 nodes or rarely with some of the spikelets on branches.

Spikelets 4- to 9-flowered, 6 to 10 lines long; empty glumes oblong, acute, or acuminate and subulate-pointed, thick and rigid, 3- to 5-nerved, the first 3 lines long, the second 1 line longer; floral glume lance-oblong, sub-acute, rather rigid but thinner than the empty glumes, 4 to 5 lines long, 5-nerved, the outer nerves evanescent at the apex, the 3 inner ones uniting and excurrent in a hispid awn curved backward, $\frac{1}{4}$ to $1\frac{1}{2}$ inches long; palet oblong, obtuse, strongly hispid on the keels, about equaling the glume; stamens 3, with anthers $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long; ovary pubescent; grain oblong, acute at the base, flattened on one side, brown, nearly opaque, 3 lines long; lodicules 2, $\frac{2}{3}$ line long; internode of rachilla thick, clavate, smooth, 1 line long.

PLATE XCVI; *a*, spikelet; *b*, empty glumes; *c*, floral glume; *d*, palet.

Northern California to Washington and eastward to New Mexico, Colorado, and Montana. The species varies considerably in the length of the awn, and is imperfectly diœcious.



AGROPYRUM DIVERGENS Nees

Holm, del.



1900-1901

ELYMUS ARENARIUS L. Sp. Pl. i. 83 (1753).

Plant perennial, from a thick rootstock.

Culm erect, velvety-pubescent at the top or nearly smooth, robust, 2 to 3 feet tall.

Leaves of the sterile shoots with loose sheaths and thick, involute blades 1 to 2 feet long; leaves of the culm usually 3; sheaths rather loose, striate, smooth or pubescent, nearly closed at the throat, mostly shorter than the internodes; blades involute and rigid toward the point, slightly scabrid above; ligule less than 1 line long.

Inflorescence a linear, erect, usually rigid spike 5 to 10 inches long, with 2 or 3 sessile, appressed spikelets at each of the 12 to 18 nodes.

Spikelets 3- to 5-flowered, 9 to 12 inches long; empty glumes lance-ovate, acute or subulate-pointed, pubescent, indistinctly 5-nerved, some of the nerves very prominent, 8 to 11 lines long, the second 1 line longer than the first, each exceeding the adjacent florets; floral glume lance-ovate, acute, smoothish to villous-pubescent, 7-nerved, 7 to 9 lines long; palet oblong, bifid at the apex, pubescent on the keels, about equaling the glumes, ovary pubescent; lodicules 2, lanceolate, ciliate on the margins, 2 lines long.

PLATE XCVII; *a*, spikelet with florets lifted out of the empty glumes and spread out somewhat; *b*, floral glume, dorsal view; *c*, palet, ventral view; *d*, pistil and lodicules.

Oregon to Alaska, mostly near the coast, and on the Atlantic coast from Labrador to Maine. This is evidently the same species described as *Elymus mollis* Trin. in Spreng. Neue Entdeck. ii. 72 (1821). There is another and different *E. mollis*, R. Br. App. Frankl. Jour. 732 (1823), which is probably the same as *E. dasystachys* Trin. in Ledeb. Fl. Alt. i. 119 (1829).



ELYMUS ARENARIUS L.



ELYMUS CONDENSATUS Presl. Rel. Hænk. i. 265 (1830).

Plant perennial, often in bunches, usually glaucous throughout, from a strong rootstock.

Culms erect, nearly smooth, or pubescent near the nodes, leafy nearly to the panicle, 5 to 10 feet tall, and in the larger specimens $\frac{1}{2}$ inch thick.

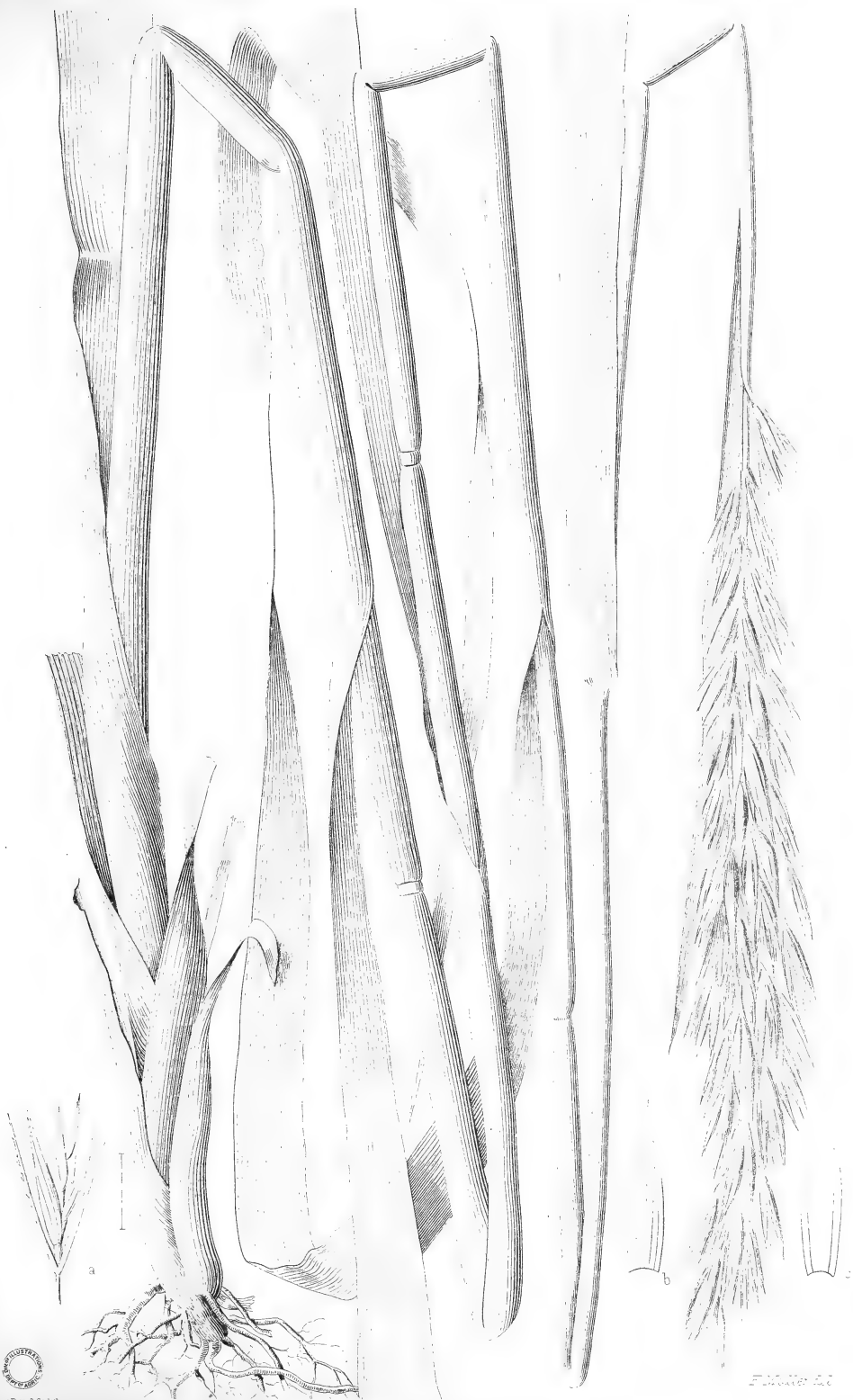
Leaves of the culm 4 to 8; sheaths rather loose, half open at the throat, nearly smooth, often exceeding the internodes; blades flat, or involute and rigid toward the long, tapering points, hispid or nearly smooth; 3 to 12 lines wide, 10 to 20 inches long; ligule obtuse, 1 to 2 lines long.

Inflorescence an erect, spicate panicle, usually dense, $\frac{1}{2}$ to 1 inch thick and 6 to 12 inches long, the smaller, more common forms with 2 to 5 spikelets sessile or nearly sessile at each node of the nearly smooth rachis, the larger forms with some of the spikelets on appressed rays 1 to 2 inches long.

Spikelets 3- to 6-flowered, 6 to 8 lines long; empty glumes subulate, rigid, hispid, the second slightly broadened and 3-nerved below, nearly equal, 5 to 7 lines long; floral glume lance-ovate, acute or 3-toothed at the apex, often short-awned, hispid-ciliate on the margins and nerves, 5- to 7-nerved, 4 to 5 lines long; palea lance-oblong, 2-toothed at the apex, slightly hispid on the 2 keels and minutely fimbriate on the upper margins, nearly equaling the glume; stamens 3, included; ovary pubescent, with 2 branching stigmas; lodicules 2, fringed, 1 line long; internode of the rachilla clavate, finely strigose-pubescent.

PLATE XCVIII; *a*, spikelet; *b*, empty glumes; *c*, floral glume, dorsal view.

California to Washington, and eastward to Wyoming, Colorado, and New Mexico. Exceedingly variable in general size and in the form of the panicle. Valuable as a forage plant, and good for hay if cut before it becomes too coarse.



ELYMUS CONDENSATUS Pres.

No. 99.

ELYMUS TRITICOIDES Nutt. in Buckl. Proc. Acad. Phila. for 1862, 99
(1862).

Plant perennial, from a strong rootstock.

Culms erect, often branching at the base, leafy throughout, smooth, 3 to 5 feet tall.

Leaves of the culm 5 to 7; sheaths striate, smooth, usually exceeding the internodes; blades flat, or involute toward the points, striate, smooth beneath, hispid and often thinly pubescent above, 2 to 4 lines wide, 6 to 12 inches long; ligule obtuse, $\frac{1}{2}$ line long or less.

Inflorescence an erect, spicate panicle, usually somewhat interrupted or loosely flowered, 4 to 8 inches long, with 1 to 3 spikelets at each node of the rachis, usually exceeding the internodes.

Spikelets 5- to 10-flowered, 7 to 10 lines long; first empty glume subulate, hispid, 1-nerved, rigid, 4 to 6 lines long; second empty glume very narrowly ovate, rigid, hispid, 3-nerved below, about 1 line longer than the first; floral glume lance-ovate, acute or more often distinctly awned, smooth below, hispid near the apex, 7-nerved, 4 to 5 lines long; palea lance-oblong, obtuse or emarginate, hispid on the prominent green keels and minutely ciliate on the margins above, two-thirds as long as the glume; stamens 3, not exerted; ovary pubescent.

PLATE XCIX; *a*, spikelet; *b*, floral glume, dorsal view; *c*, palea opened.

California to Washington.



HYSTRIX CALIFORNICA (Boland.) O. Ktze. Rev. Gen. Pl. ii. 778 (1891).
Gymnostichum Californicum Boland. in Wats. Bot. Cal. ii. 327 (1880).

Plant perennial, with coarse, woolly roots, and a more or less developed rootstock;
Culms erect, nearly smooth, robust, 2 to 4 feet tall, leafy nearly to the panicle.

Leaves of the culm, 3 or 4; sheaths striate, coarsely pubescent, especially below, nearly equaling or often exceeding the long internodes; blades flat, scabrid, taper-pointed, $\frac{1}{2}$ to 1 inch wide, 4 to 12 inches long; ligule obtuse, scarcely 1 line long.

Inflorescence an erect or nodding, rather loose, spicate panicle, 5 to 8 inches long, with 2 to 4 spikelets on very short-curved pedicels or prominent calluses at each of the 15 to 20 nodes of the rachis, or some of the spikelets on short rays at the lower nodes.

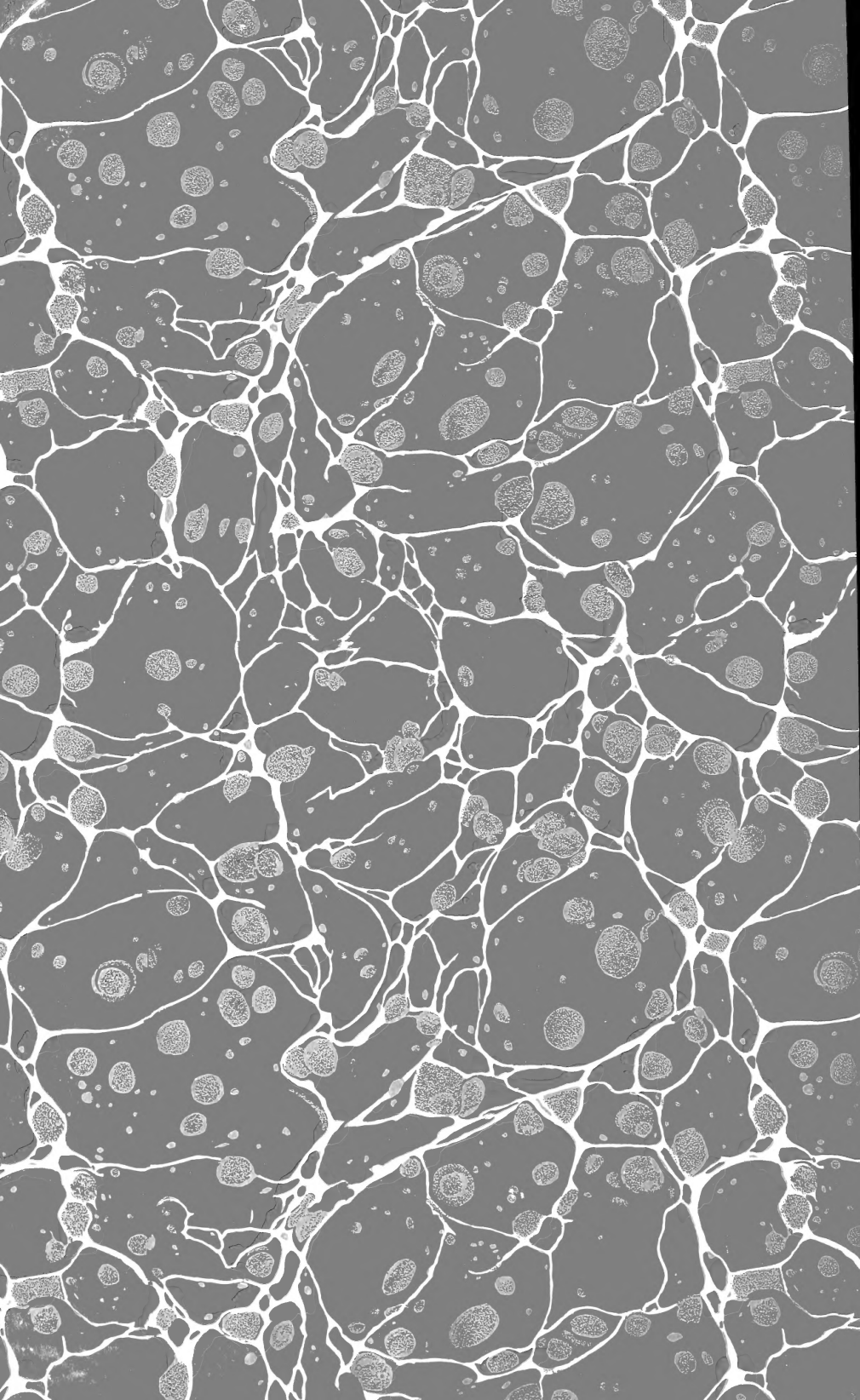
Spikelets 1- to 3-flowered; empty glumes wanting or rudimentary, capillary and early deciduous; floral glume lanceolate, acute, rather thick, rather coarsely pubescent, 5 to 6 lines long, prominently 5-nerved, the nerves all joining at the apex in a rigid, hispid awn, about 1 inch long; palea broadly lance oblong, sparsely hispid or smooth on the prominent keels, ciliate on the two prominent teeth at the apex; stamens 3, with yellow anthers 3 lines long, scarcely exerted; ovary pubescent, with a single dagger-shaped stigma $1\frac{1}{2}$ lines long; lodicules fringed, nearly 1 line long; internode of rachilla pubescent, 1 to 2 lines long, extending beyond the base of the upper floret.

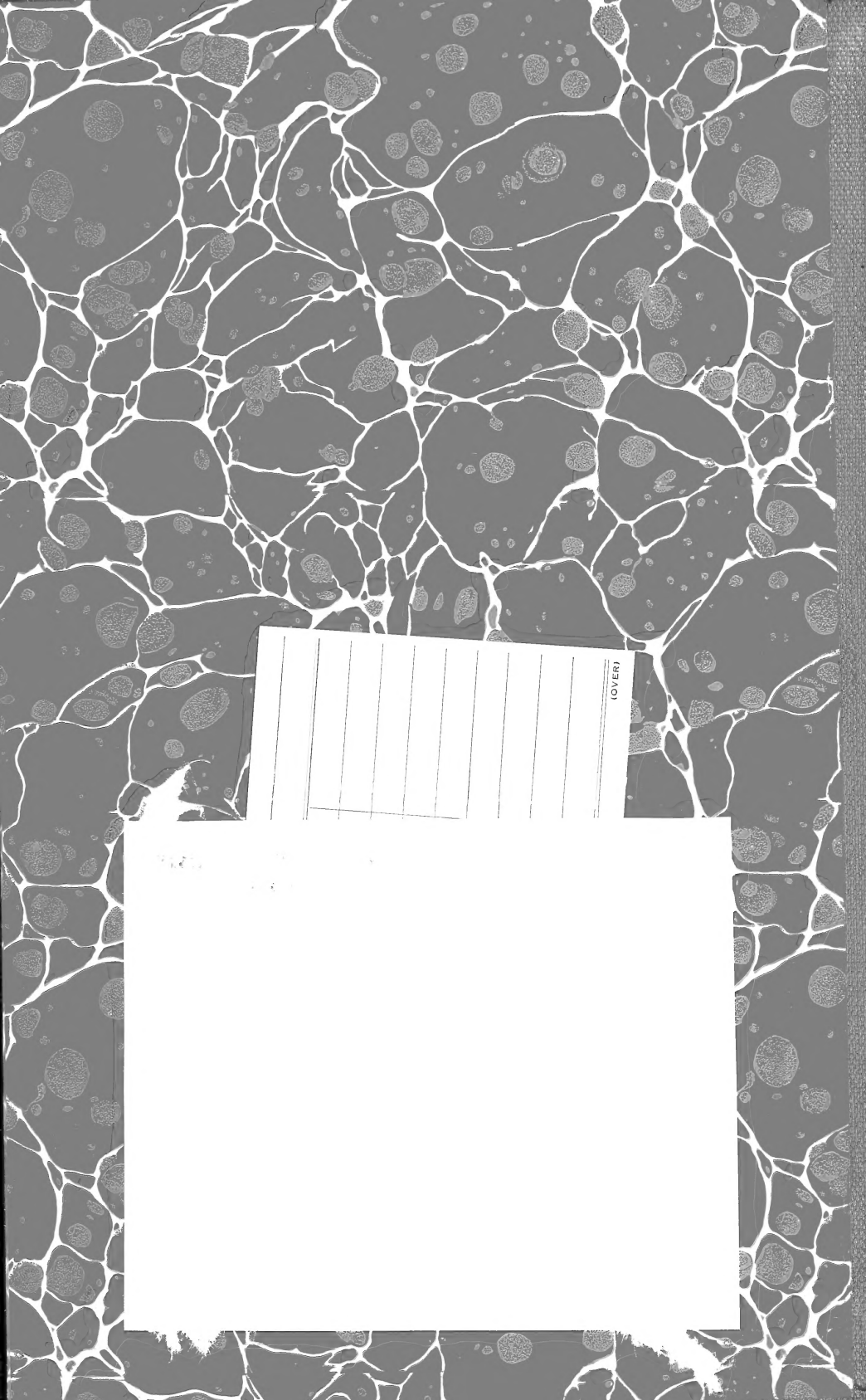
PLATE C; *a*, florets of a 3-flowered spikelet; *b*, floral glume; *c*, palea; *d*, ovary and lodicules.

California, from San Francisco southward.









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